

# COVID-19 Scenario Modeling Hub Report

17 December, 2021

Scenario Modeling Hub Team<sup>1</sup>

## Executive Summary

This report presents the results of the tenth round of projections from the COVID-19 Scenario Modeling Hub. A consortium of 6 modeling groups convened to generate week ahead projections of COVID-19 cases, deaths, and hospitalizations for a period of six or twelve months (projection period varied by model, weeks ending 2021-11-20 to either 2022-05-14 or 2022-11-05), given four scenarios of booster coverage and waning. A full list of contributors is included at the end of the report. See the table on the next page for an overview of the scenarios included in this round. Detailed scenario descriptions and setting assumptions are provided [here](#).

## Key Takeaways from the Tenth Round

Round 10 was designed to study the interaction between boosters and waning immunity. Projections were made before the emergence of Omicron was known. Given the rapid rise of Omicron globally and in the US, these projections should not be considered as predictive of the trajectory of COVID-19 in the coming weeks. Rather, these projections can be used to understand how boosters may counteract the effect of waning immunity, in the absence of a new variant.

- As regards cumulative outcomes, the ensemble and most (but not all) models rank the four scenarios from best to worst (1) optimistic waning, widespread boosters (2) pessimistic waning, widespread boosters, (3) optimistic waning, restricted boosters, (4) pessimistic waning, restricted boosters.
- In scenarios with low booster coverage (coverage saturates at 40% of adults who have received a full initial vaccine course), case incidence is expected to rise again in Spring 2022, even in the absence of new variants. The rise is observed whether waning occurs on short (6 months) or long (12 months) time scales. In scenarios with high booster coverage, incidence declines throughout the first few months of 2022.
- Increased booster coverage among adults from 40% to 70% would reduce cumulative cases by 14-17% and cumulative deaths by 17-20% by April 2022 based on the median ensemble; however there are large variations in the impact of boosters between models. Booster uptake should be encouraged to buffer against our uncertainty about waning.
- There is considerable variability in the trajectory of individual models, and the projected impact of waning. This is reflected in the very broad 95% projection intervals of the ensemble. For instance, there is little effect of waning or boosters on MOBS projections. The UVA-epiHiper model projects two periods of rising incidences in Spring 2022 and at the end of 2022, while only the second rise is observed in the USC and UVA-adaptive models. In some models and some states, incidences are projected to rise until the end of Jan 2022, even in the absence of a new variant.
- Recent observations support a persistently high level of transmission of COVID-19 in late fall fueled by the Delta variant, presumably driven by seasonal effects and behavior. Despite the seemingly worsening situation, ensemble projections suggest a continued decline of COVID-19 throughout the holiday period, absent a new variant.
- The impact of boosters in the coming weeks is likely to be greater than portrayed here, in light of the epidemiology of Omicron.

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<sup>1</sup>Compiled by Justin Lessler, Rebecca Borcherding, Emily Howerton, and Claire Smith.

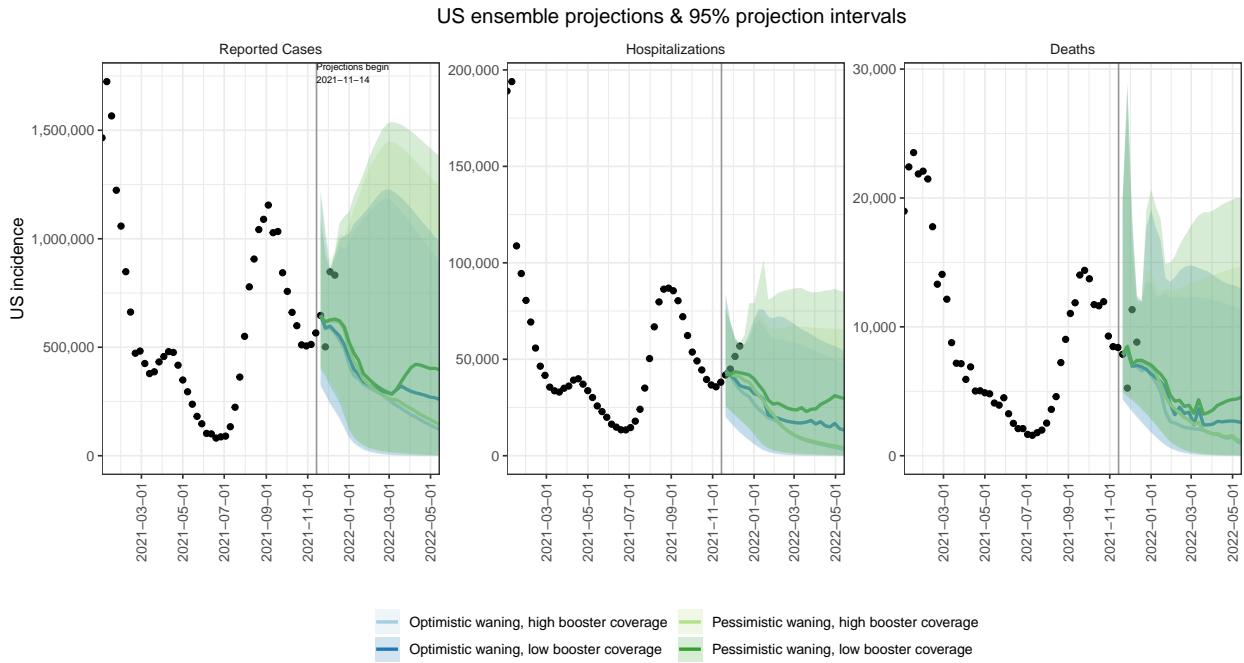
## Round 10 Scenario Specifications

See detailed notes on each scenario below	<b>High booster coverage</b> (booster coverage saturates at <b>70%</b> of adults who previously received a full vaccine course)	<b>Low booster coverage</b> (booster coverage saturates at <b>40%</b> of adults who previously received a full vaccine course)												
<b>Optimistic waning:</b> <ul style="list-style-type: none"> <li>• <b>Slow immune waning</b>, average transition time to partially immune state = <b>1 year</b></li> <li>• In partially immune state,           <table border="1"> <thead> <tr> <th>Protection from</th><th>&lt; 65 yrs</th><th><b>≥ 65yrs</b></th></tr> </thead> <tbody> <tr> <td>infection</td><td>60%</td><td>40%</td></tr> <tr> <td>hosp.</td><td>90%</td><td>80%</td></tr> <tr> <td>death</td><td>95%</td><td>90%</td></tr> </tbody> </table> </li> </ul>	Protection from	< 65 yrs	<b>≥ 65yrs</b>	infection	60%	40%	hosp.	90%	80%	death	95%	90%	<b>Scenario A</b>	<b>Scenario B</b>
Protection from	< 65 yrs	<b>≥ 65yrs</b>												
infection	60%	40%												
hosp.	90%	80%												
death	95%	90%												
<b>Pessimistic waning:</b> <ul style="list-style-type: none"> <li>• <b>Fast immune waning</b>, average transition to partially immune state = <b>6 months</b></li> <li>• In partially immune state,           <table border="1"> <thead> <tr> <th>Protection from</th><th>&lt; 65 yrs</th><th><b>≥ 65yrs</b></th></tr> </thead> <tbody> <tr> <td>infection</td><td>50%</td><td>30%</td></tr> <tr> <td>hosp.</td><td>80%</td><td>70%</td></tr> <tr> <td>death</td><td>90%</td><td>85%</td></tr> </tbody> </table> </li> </ul>	Protection from	< 65 yrs	<b>≥ 65yrs</b>	infection	50%	30%	hosp.	80%	70%	death	90%	85%	<b>Scenario C</b>	<b>Scenario D</b>
Protection from	< 65 yrs	<b>≥ 65yrs</b>												
infection	50%	30%												
hosp.	80%	70%												
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Figure 1: Round 10 Scenario Specifications

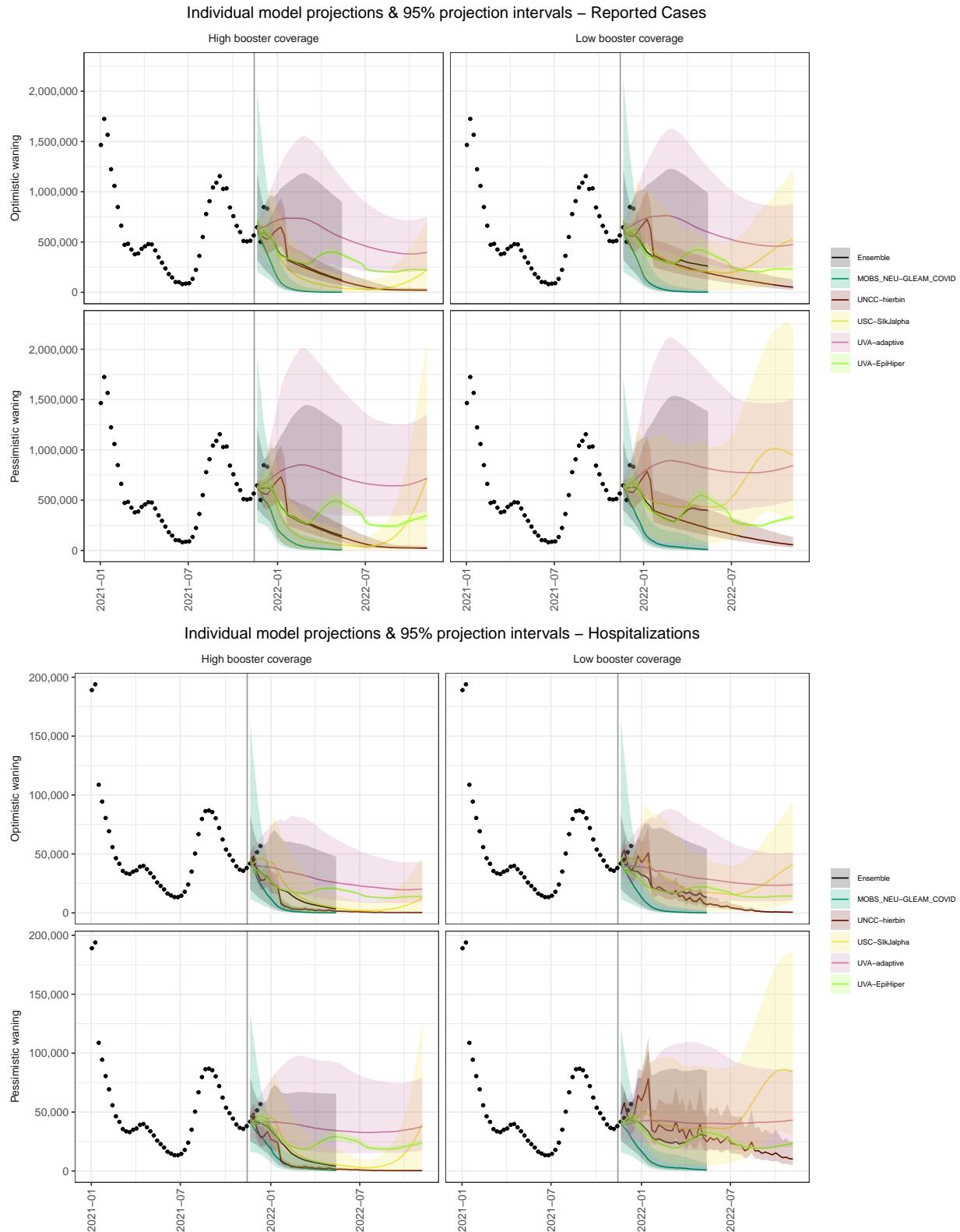
## National ensemble projections

Ensemble projections for national cases, hospitalizations and deaths separated by scenario.

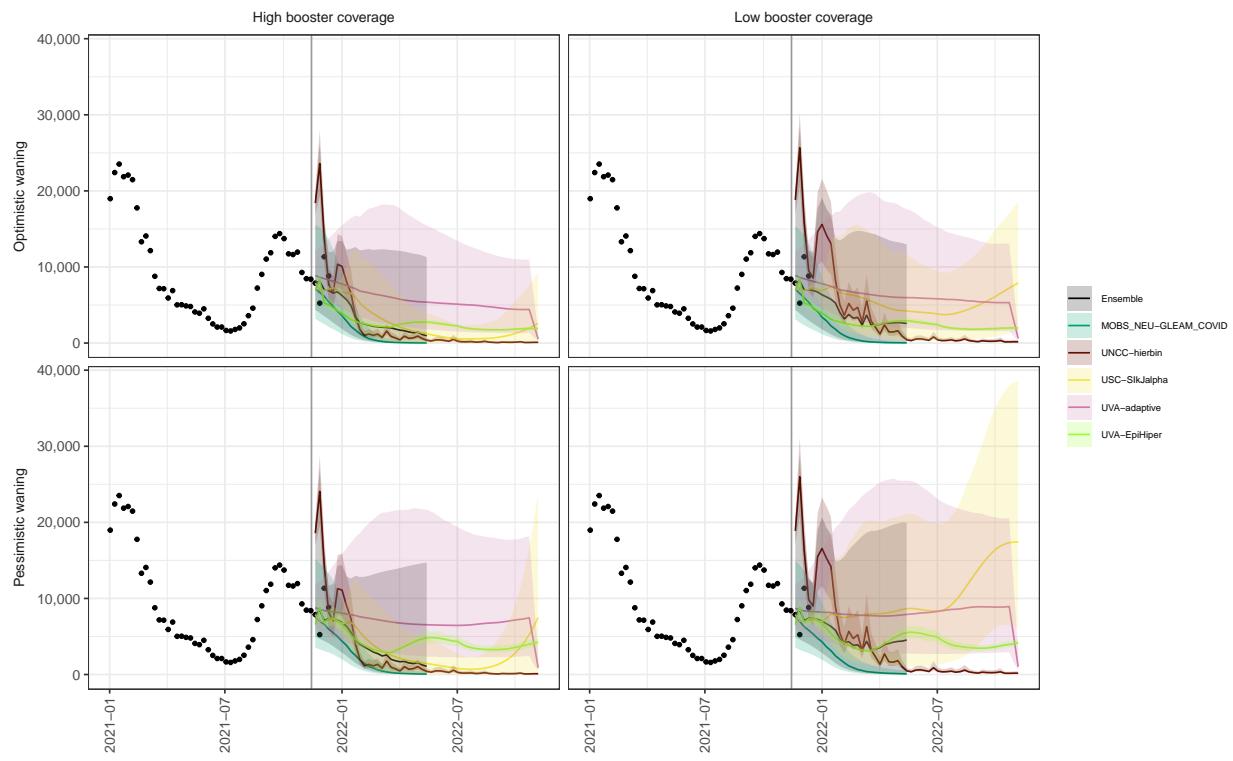


## National individual model projections

Individual model projections and ensemble by scenario for national cases, hospitalizations, and deaths.

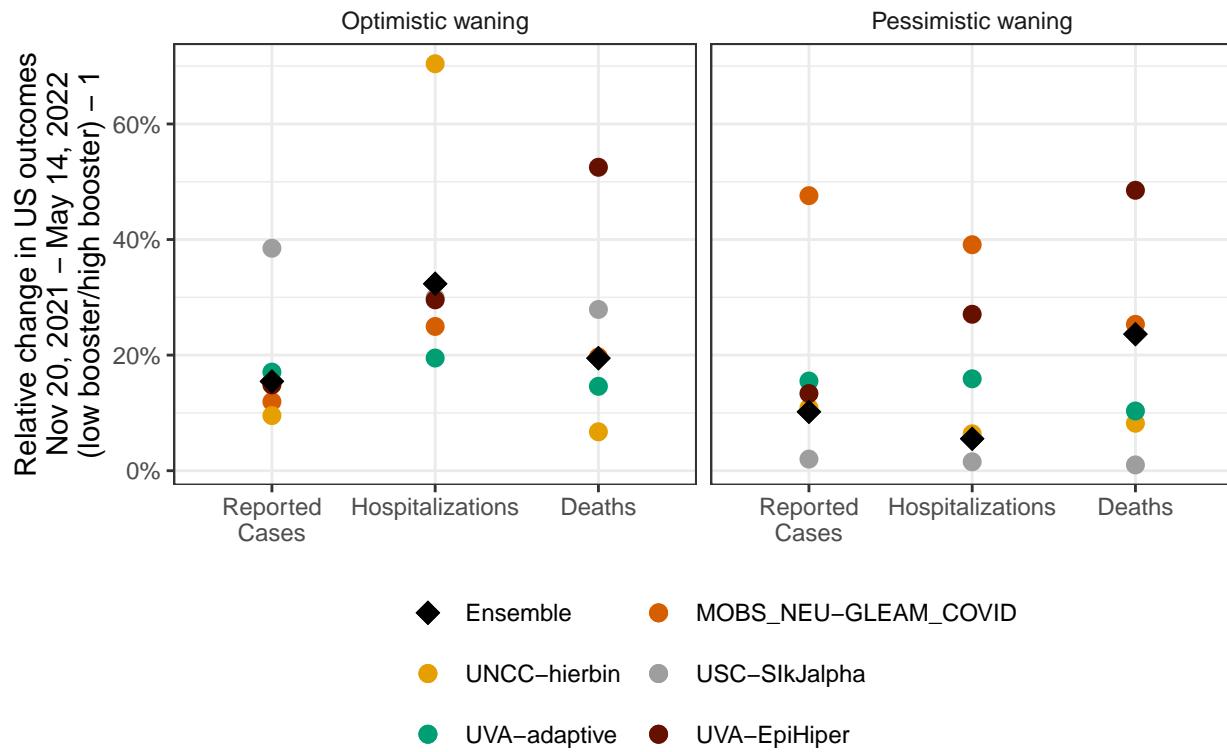


### Individual model projections & 95% projection intervals – Deaths



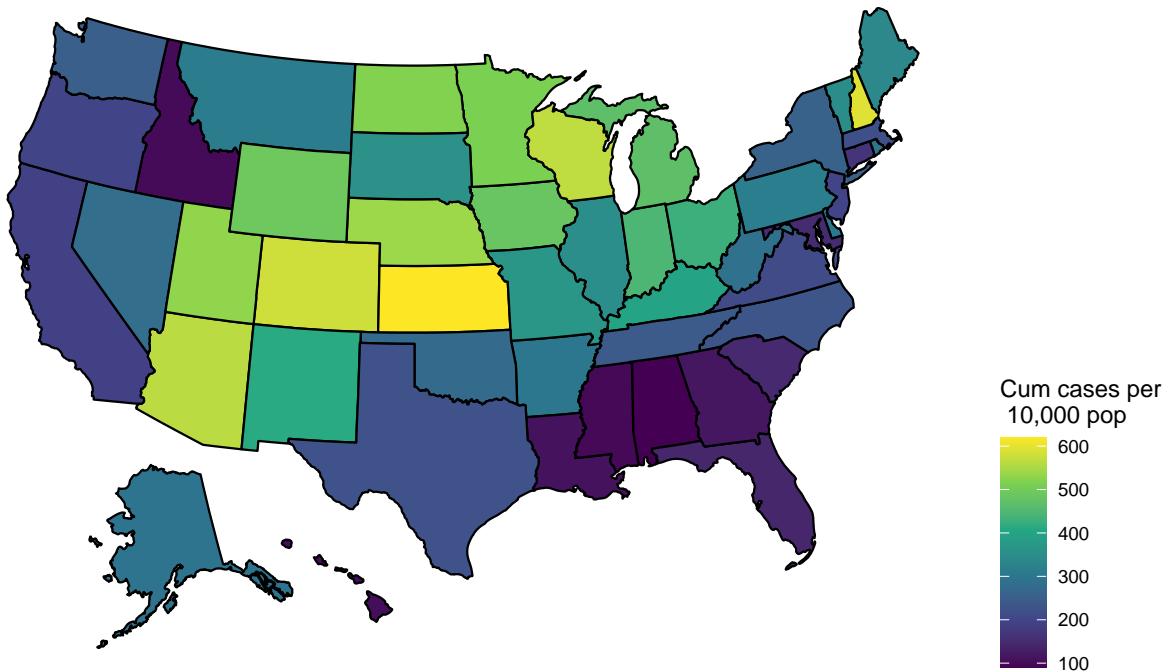
## Scenario comparison

US reported cases, hospitalizations, and deaths averted in the booster coverage scenarios for each variant assumption from November 1, 2021 until the end of the projection period.

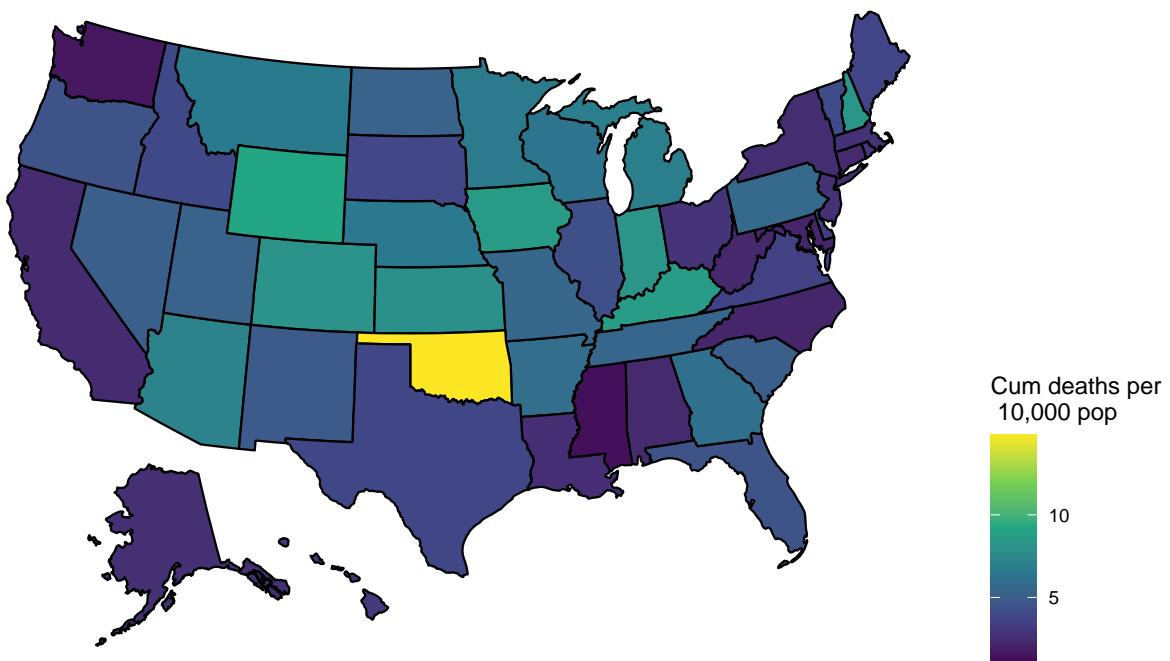


## Risk maps

Cumulative reported cases per 10,000 population in scenario with pessimistic waning, and low booster coverage: November 14, 2021 to November 05, 2022

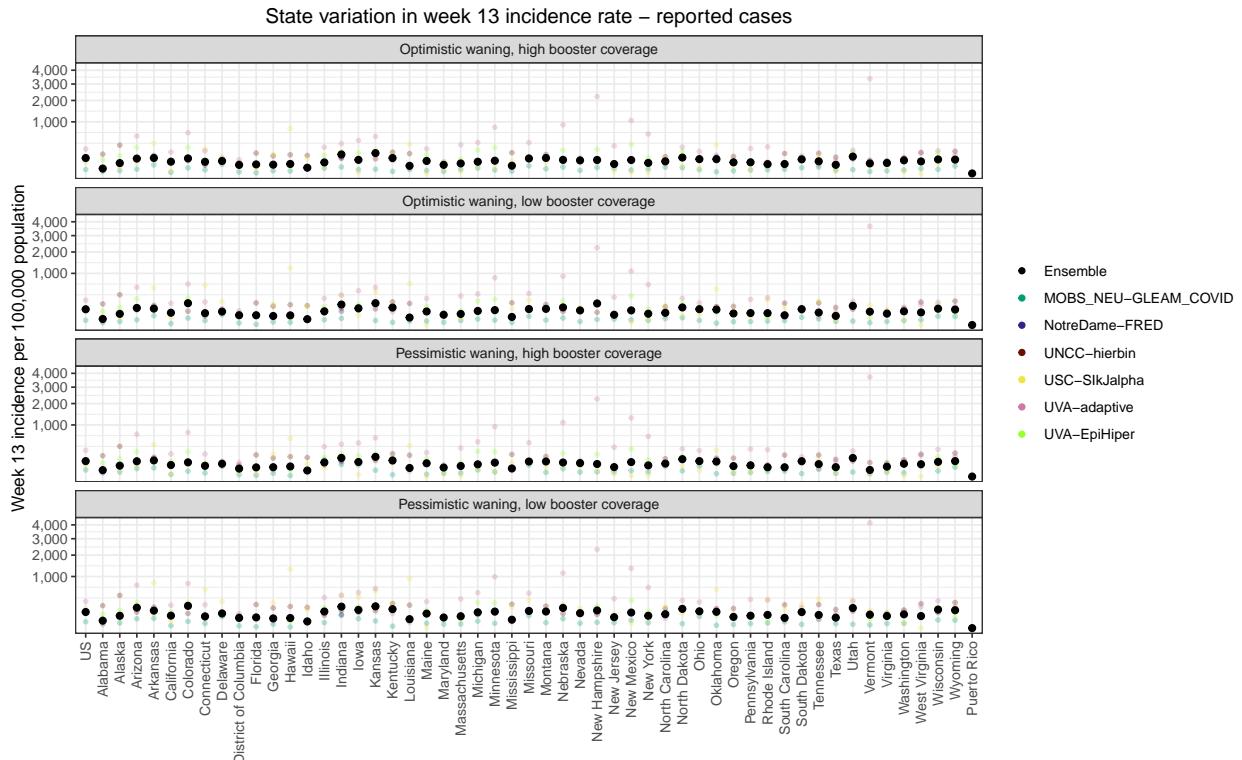


Cumulative deaths per 10,000 population in scenario with pessimistic waning, and low booster coverage: November 14, 2021 to November 05, 2022

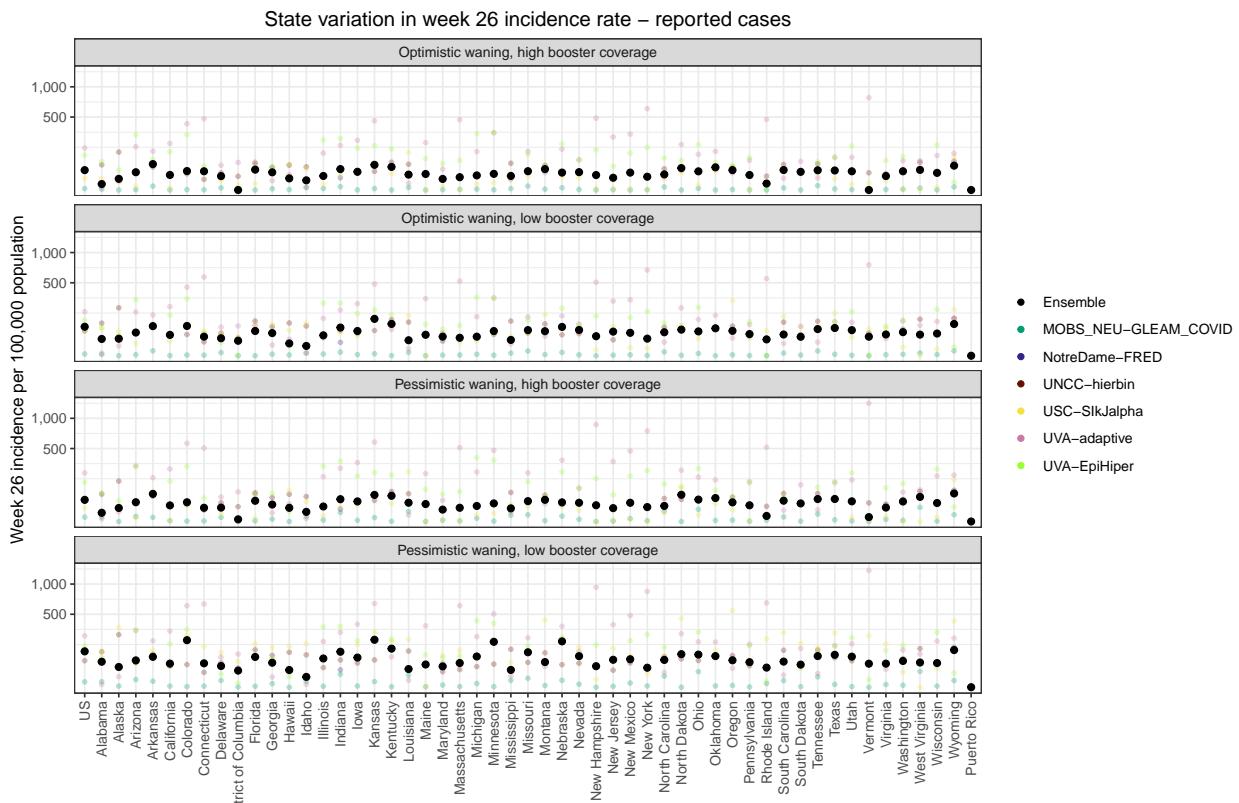


## State-level deviation from national

Individual model and ensembles projections for state-level case incidence per 100,000 population at week 13.

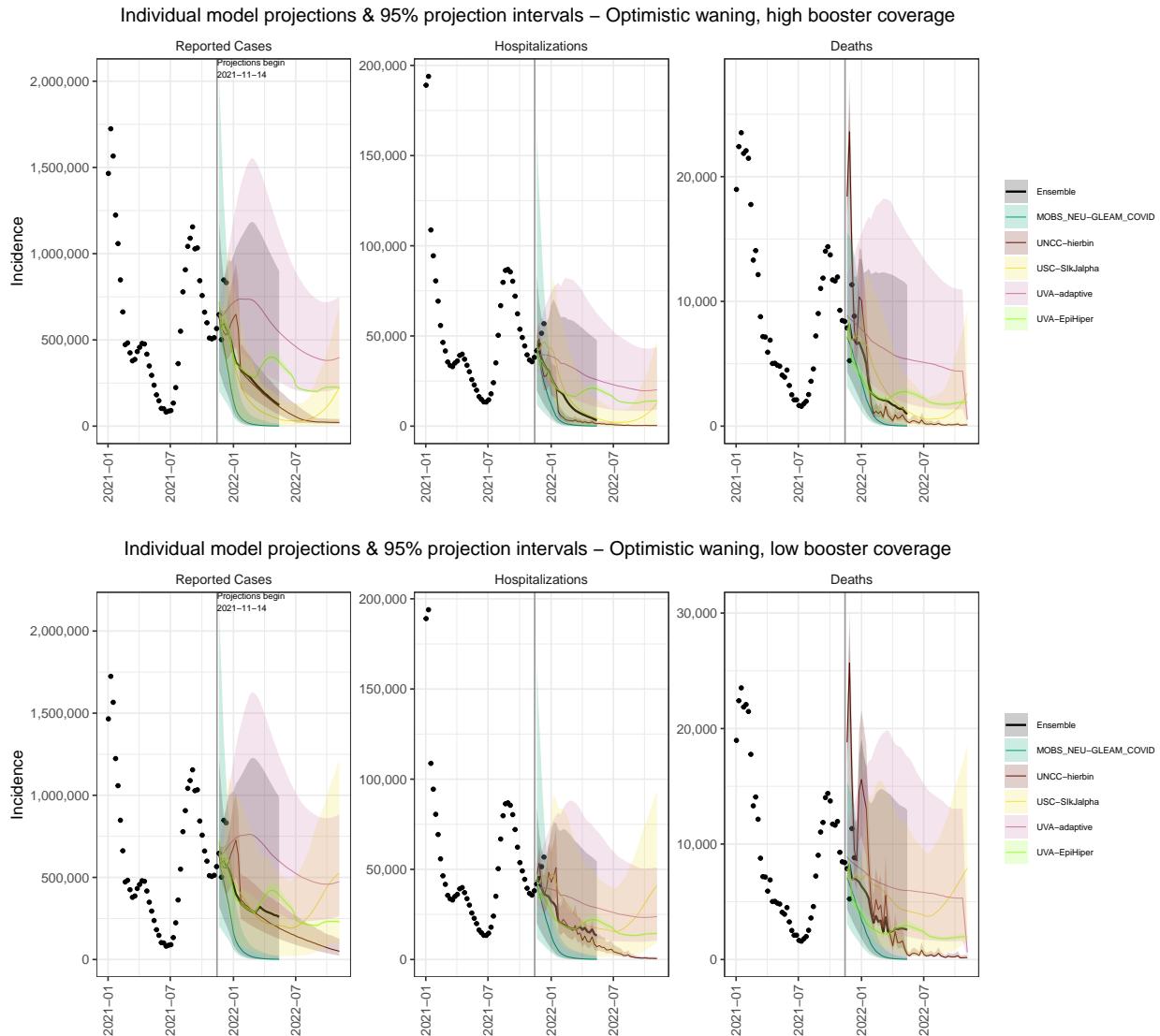


Individual model and ensembles projections for state-level incidence per 100,000 population at week 26.

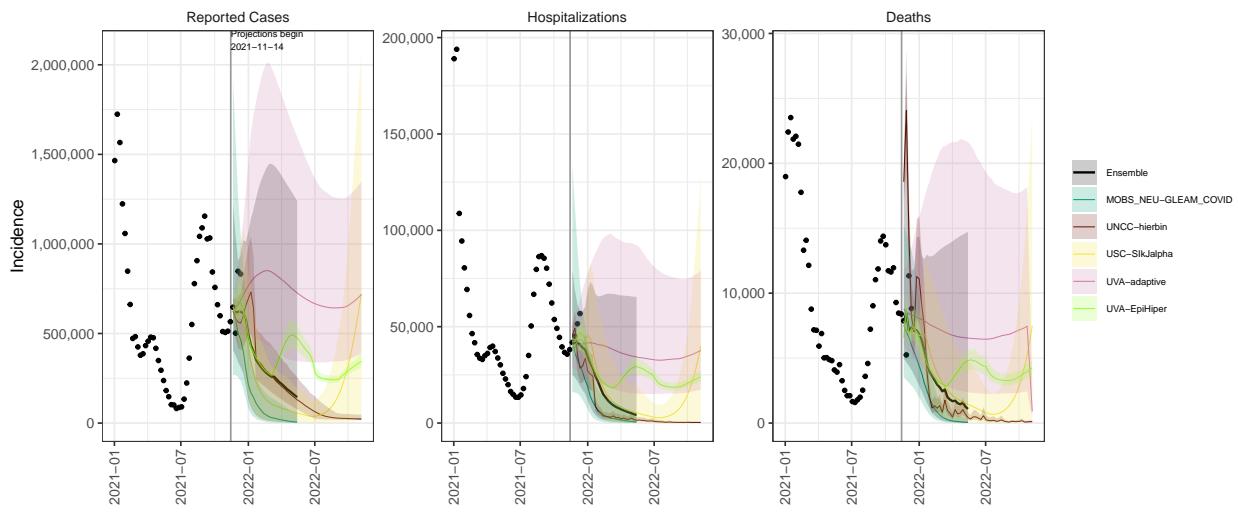


## National model variation

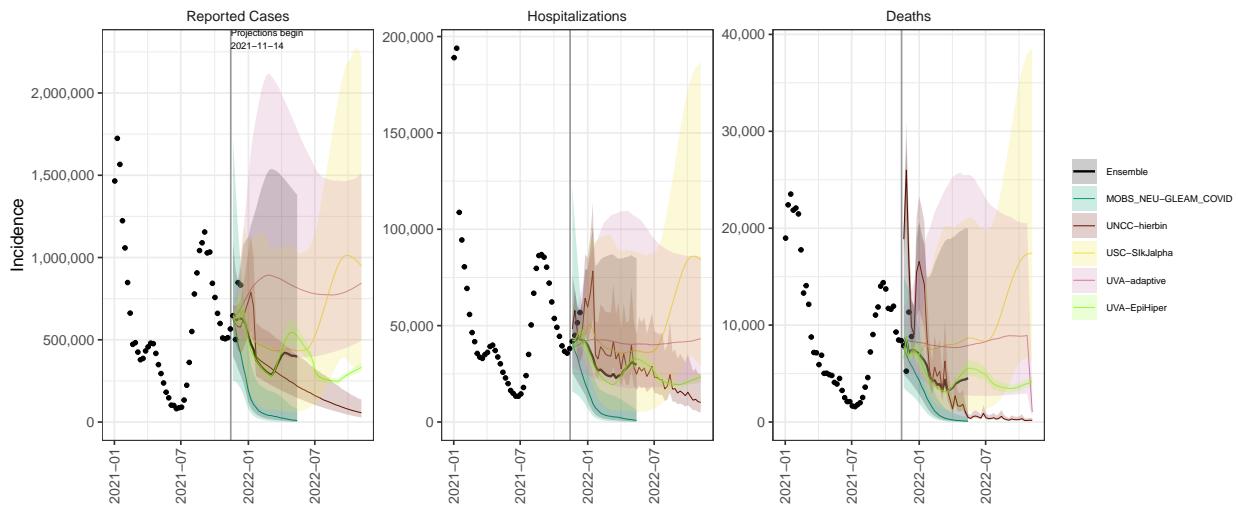
Individual model projections for national incident cases, hospitalizations and deaths.



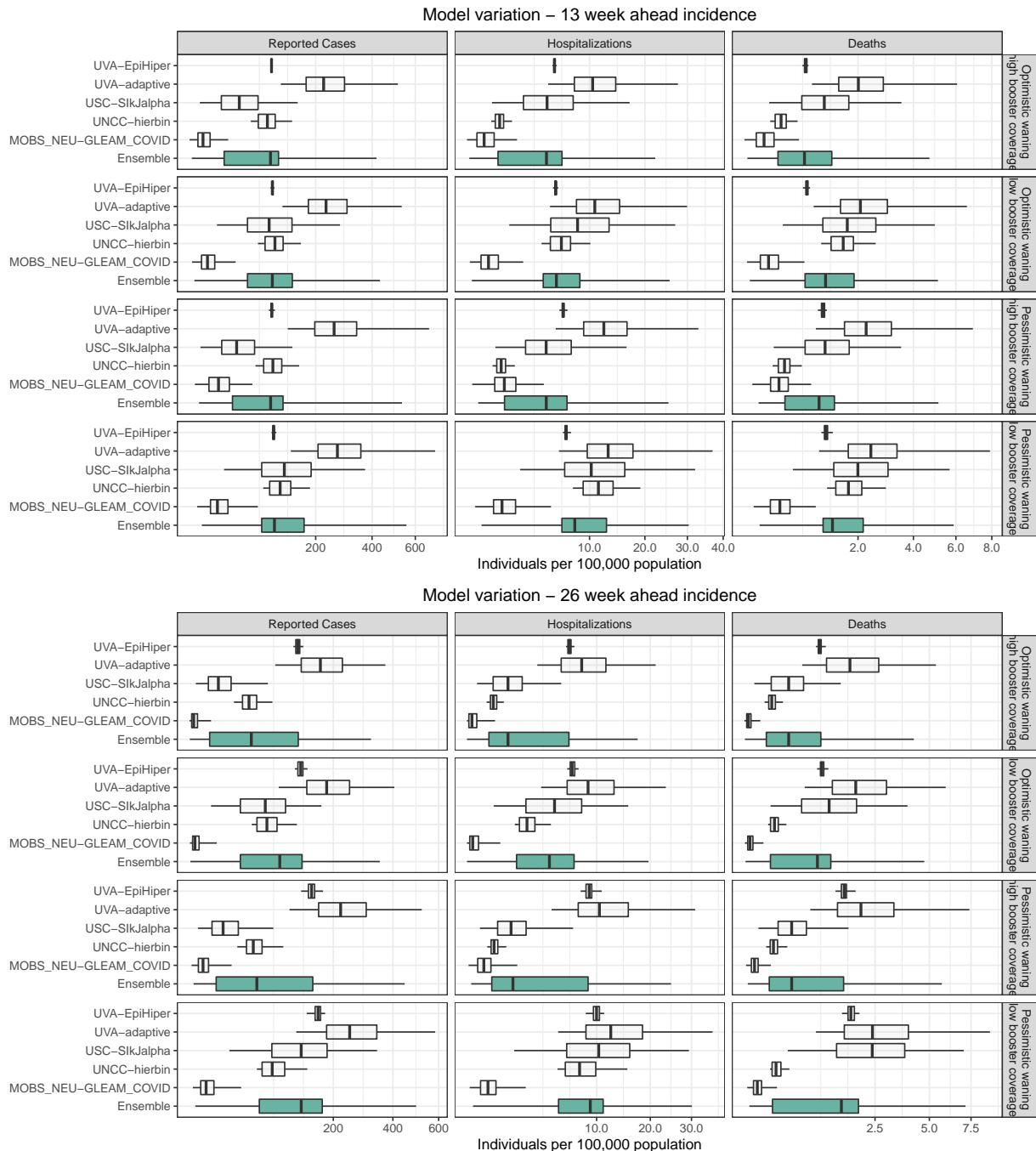
### Individual model projections & 95% projection intervals – Pessimistic waning, high booster coverage



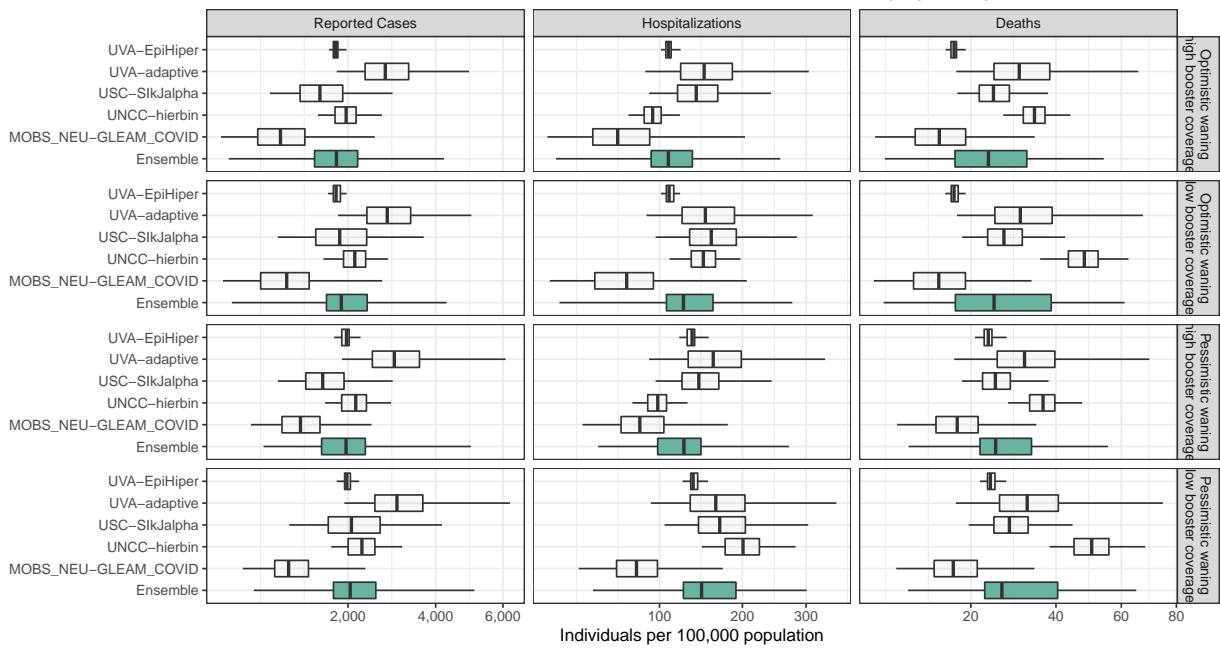
### Individual model projections & 95% projection intervals – Pessimistic waning, low booster coverage



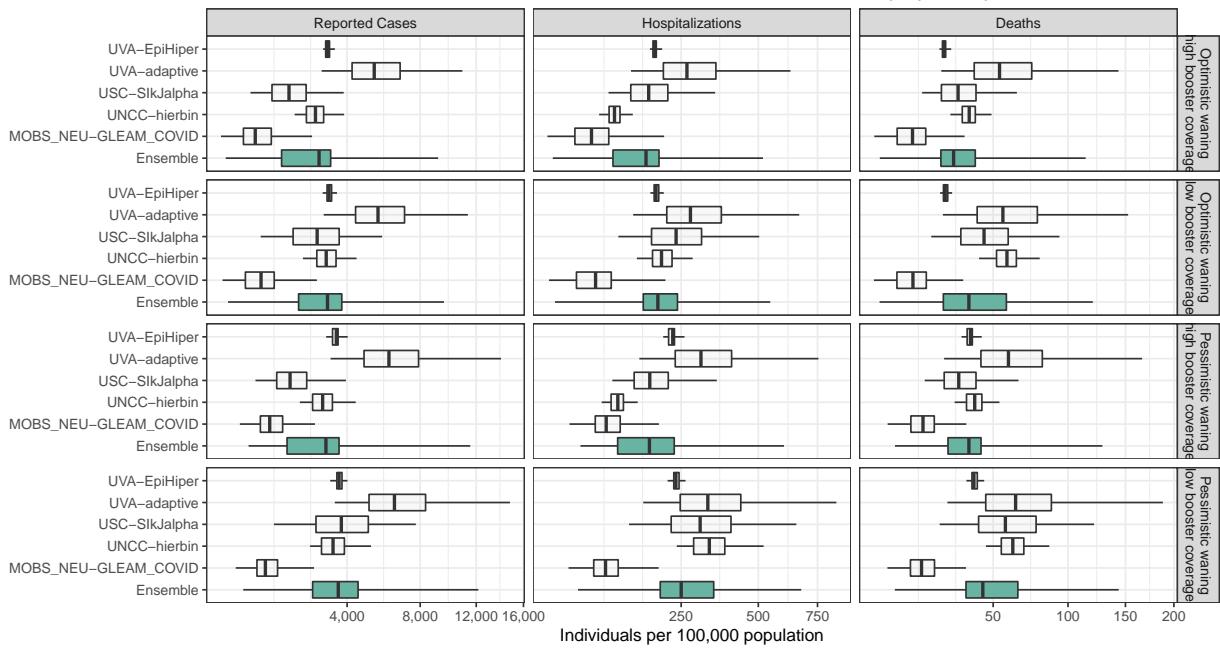
## Projection distributions



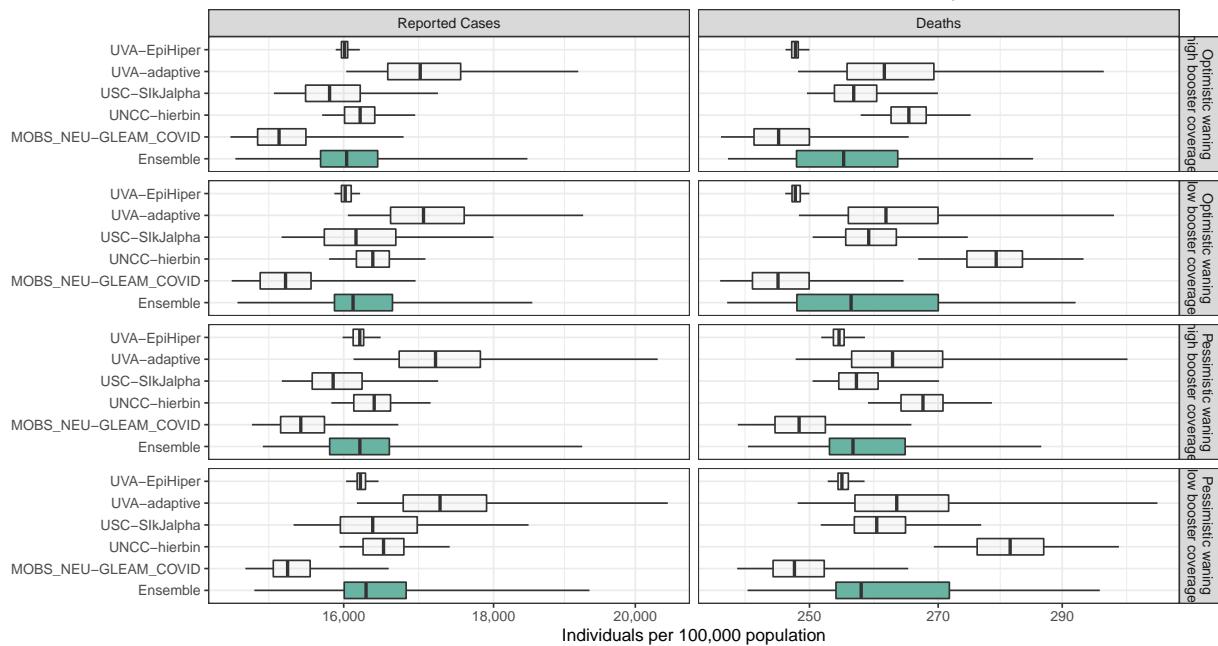
Model variation – 13 week ahead cumulative incidence over projection period



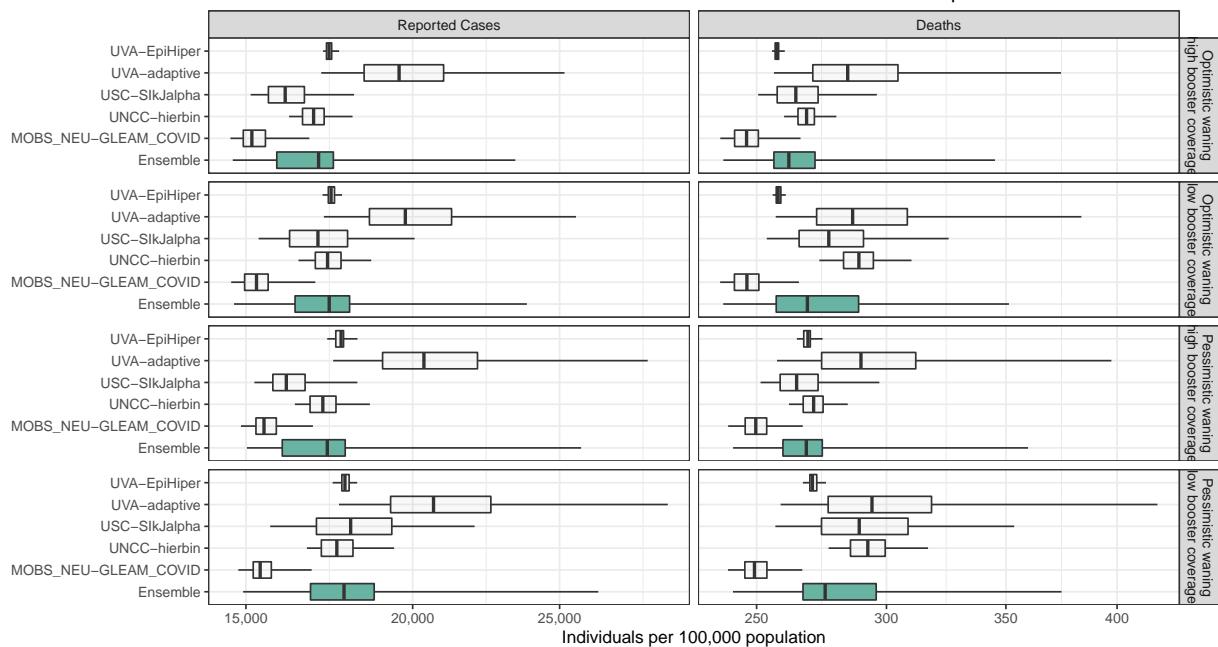
Model variation – 26 week ahead cumulative incidence over projection period



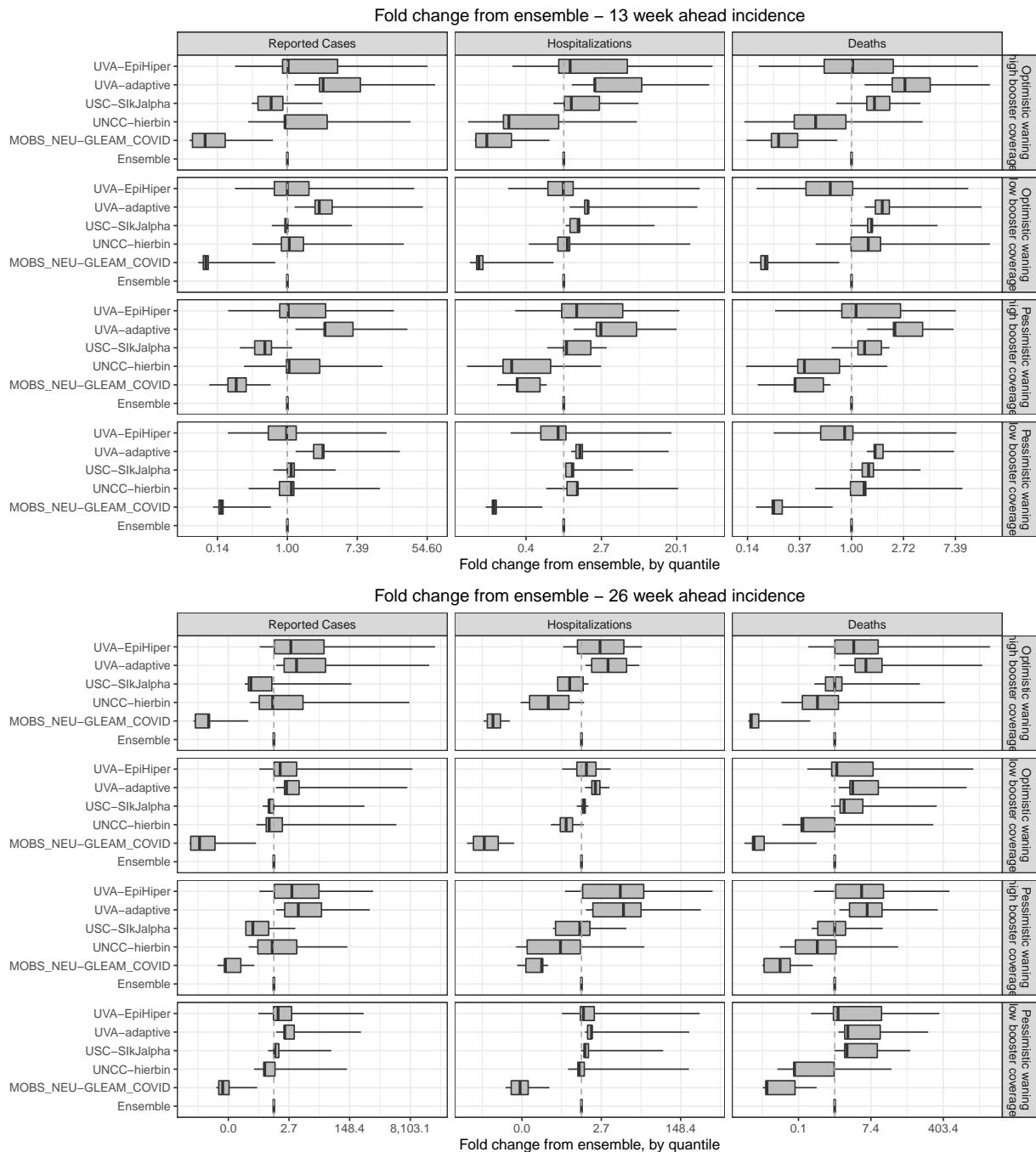
Model variation – 13 week ahead cumulative incidence over entire pandemic

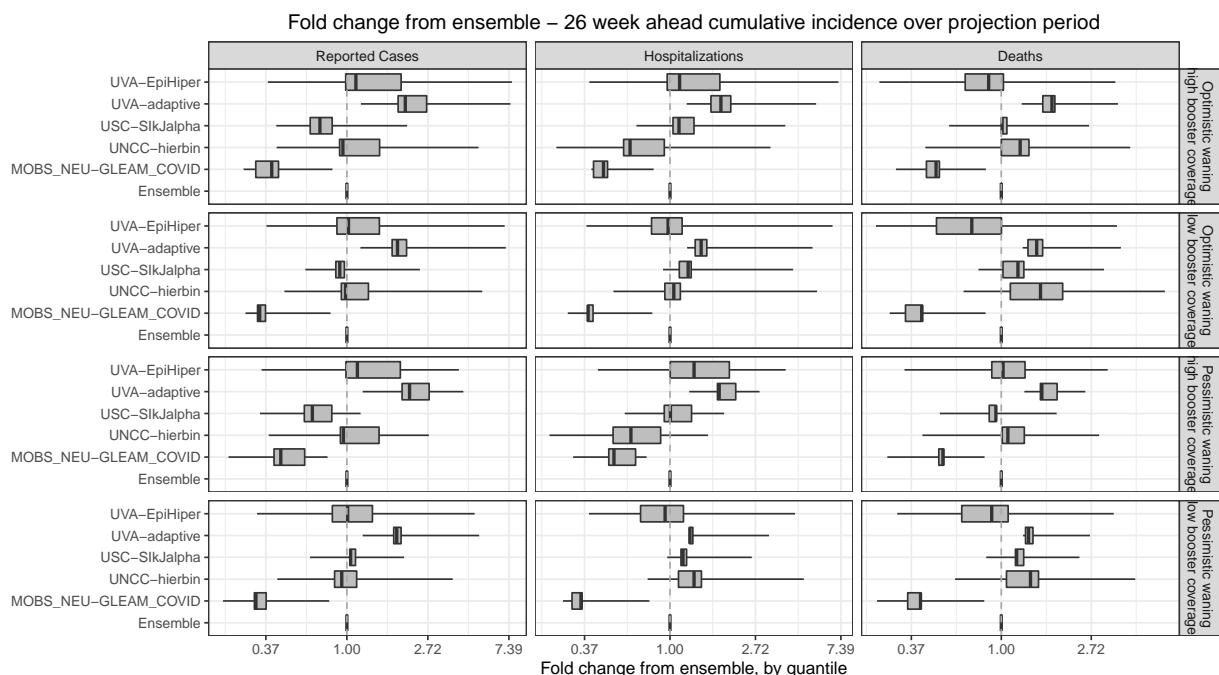
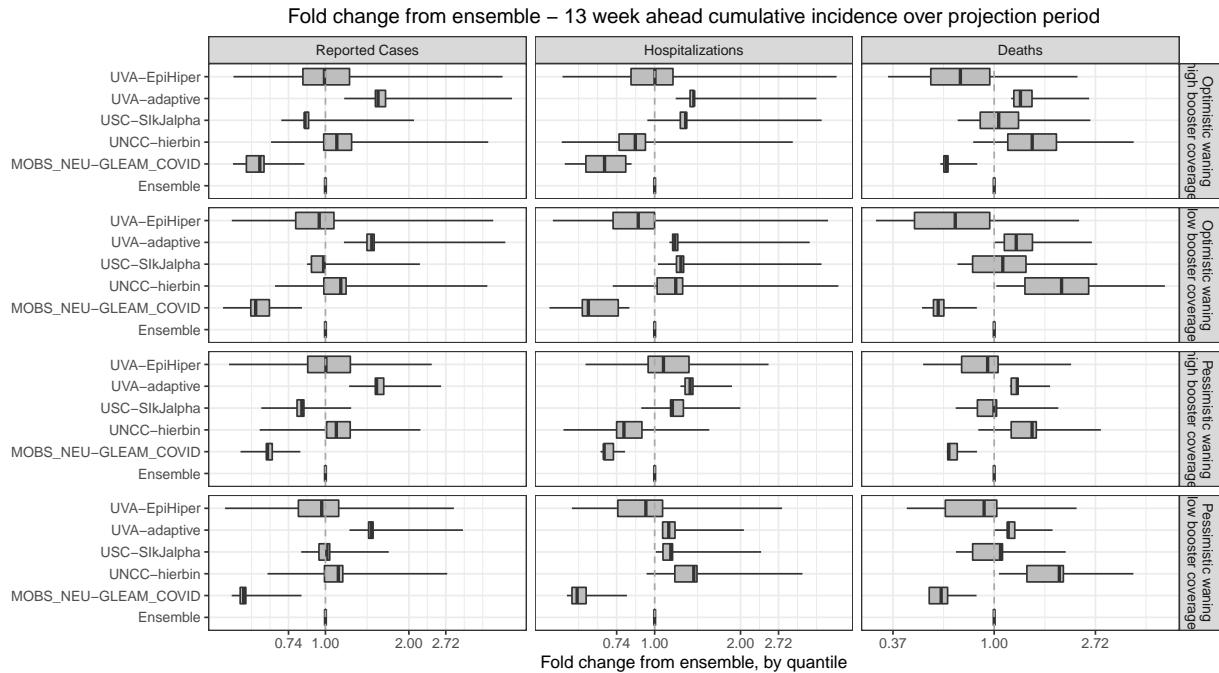


Model variation – 26 week ahead cumulative incidence over entire pandemic

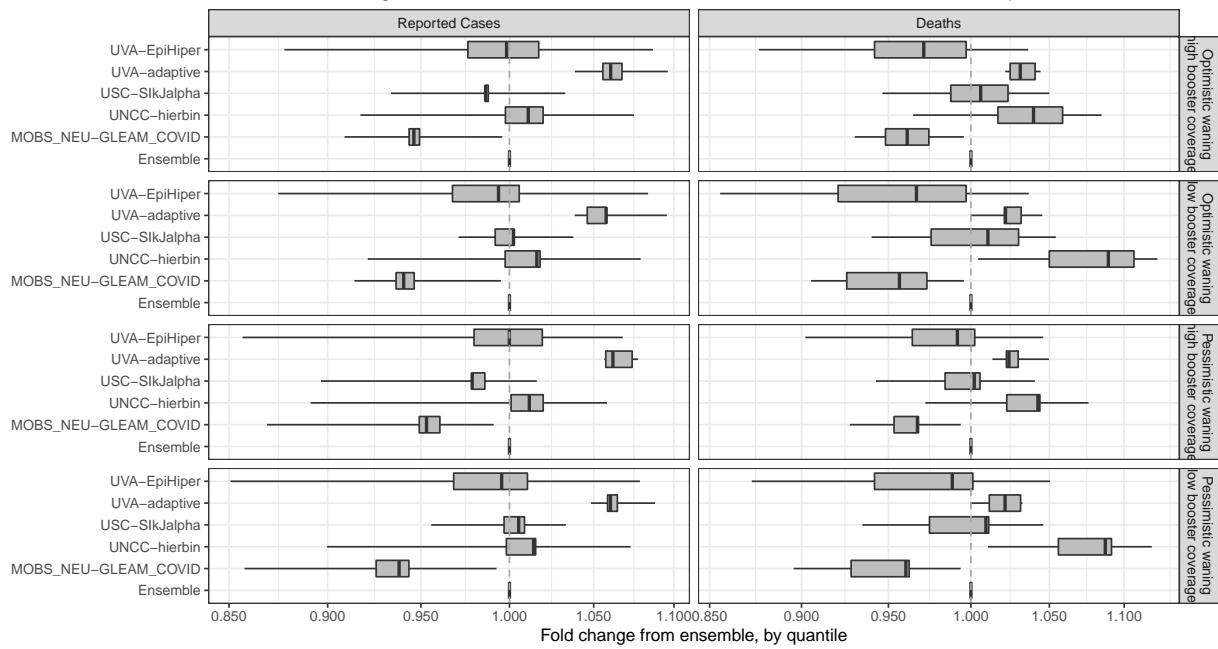


## Difference between model and ensemble distributions

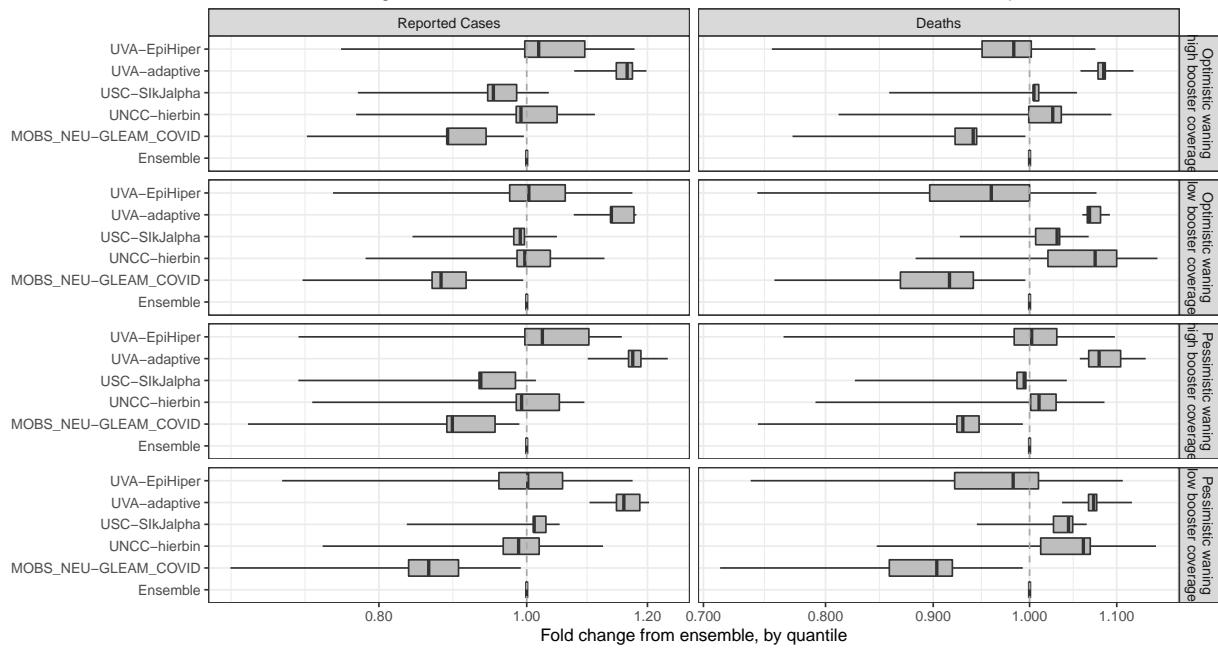




Fold change from ensemble – 13 week ahead cumulative incidence over entire pandemic

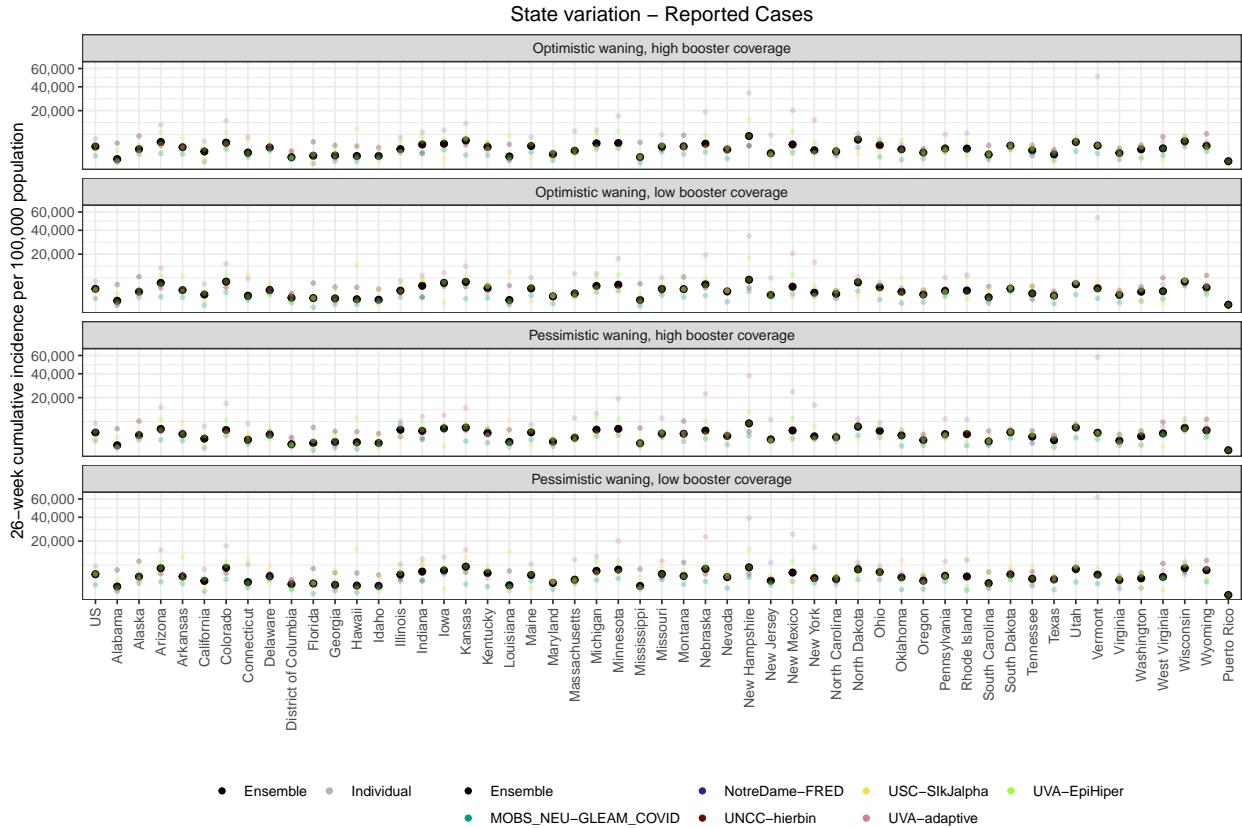


Fold change from ensemble – 26 week ahead cumulative incidence over entire pandemic

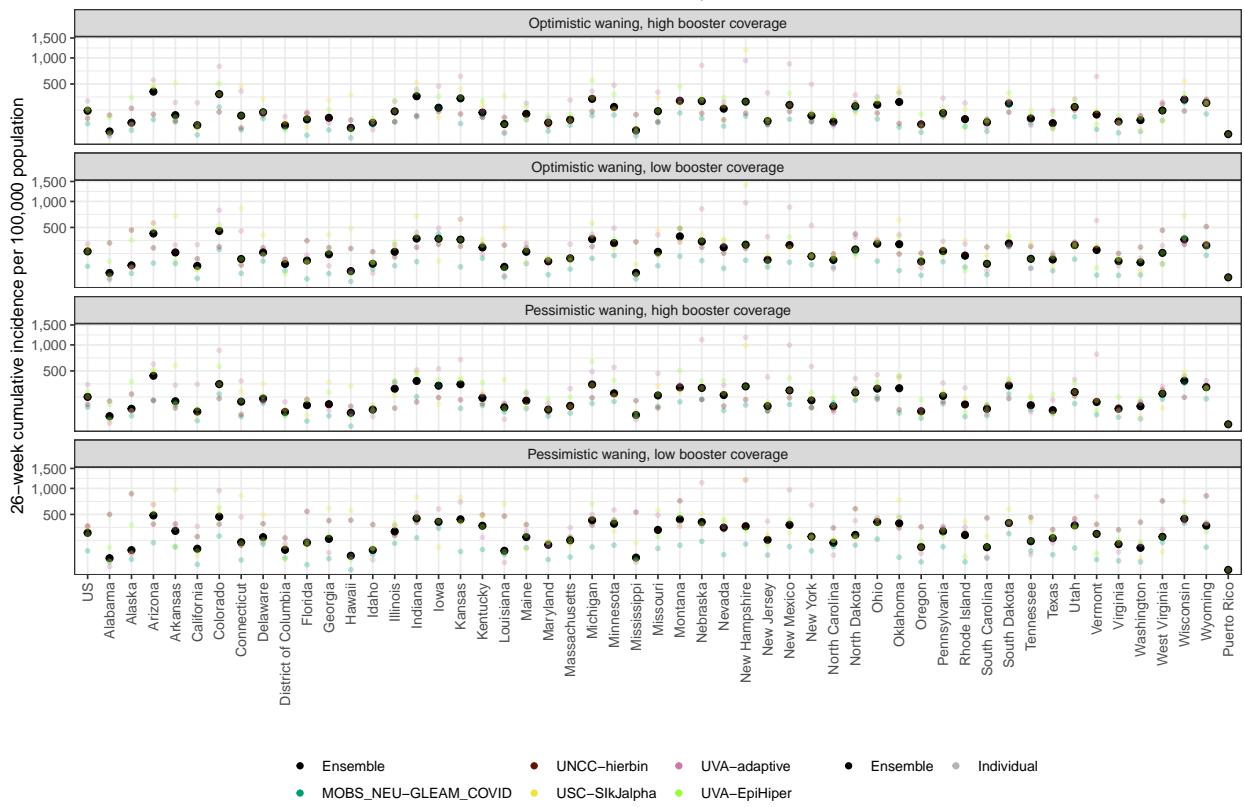


## Supplemental Plots

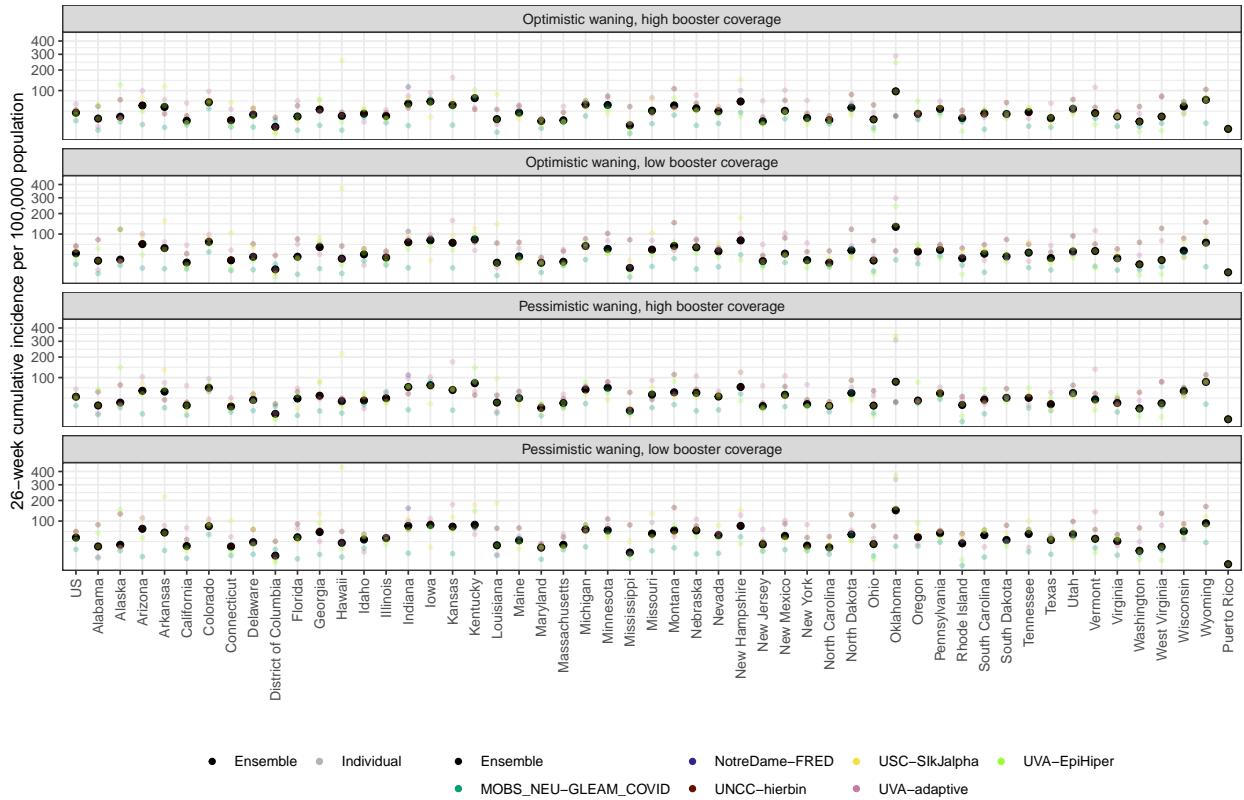
Individual model and ensembles projections for state-level cumulative incidence per 100,000 population over 26-week projection period. Please note the relatively small number of models incorporated in the ensemble at this stage, particularly states and territories for which only one or two models have submitted projections.



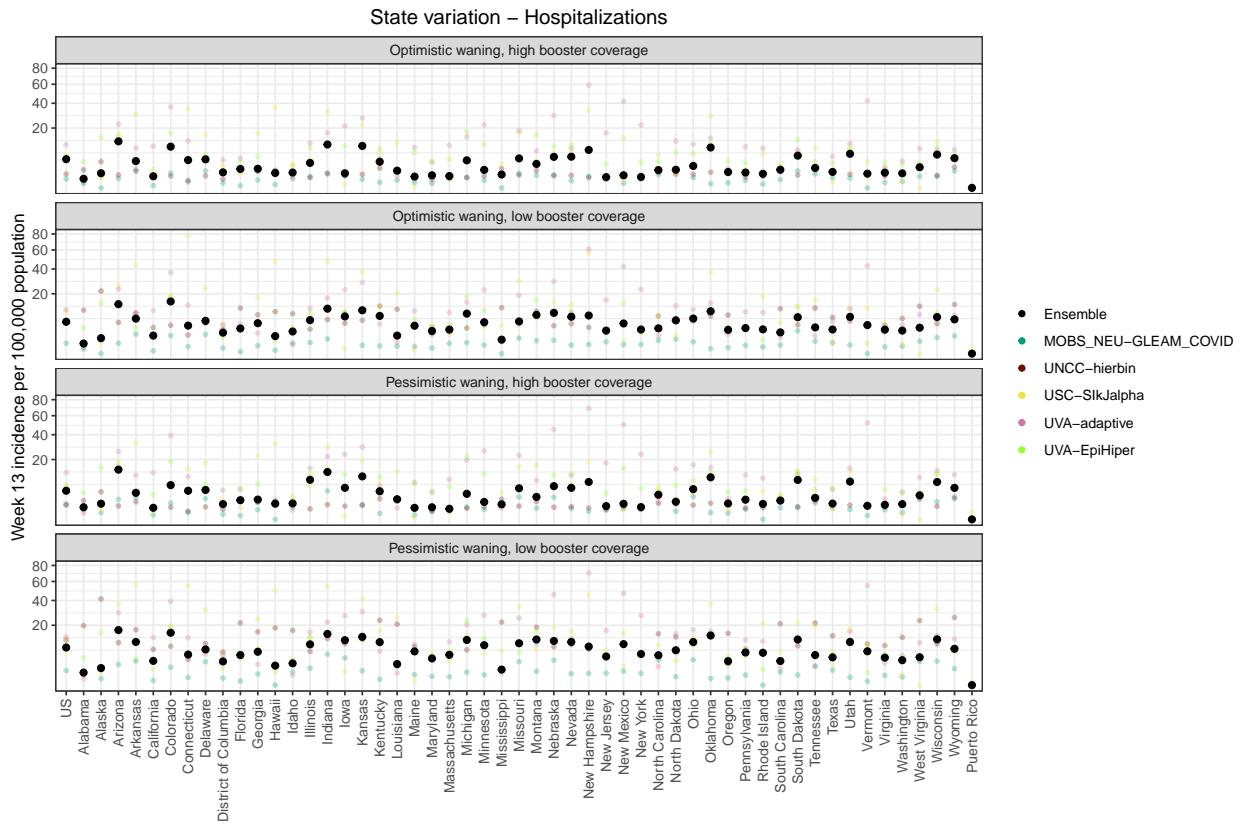
### State variation – Hospitalizations



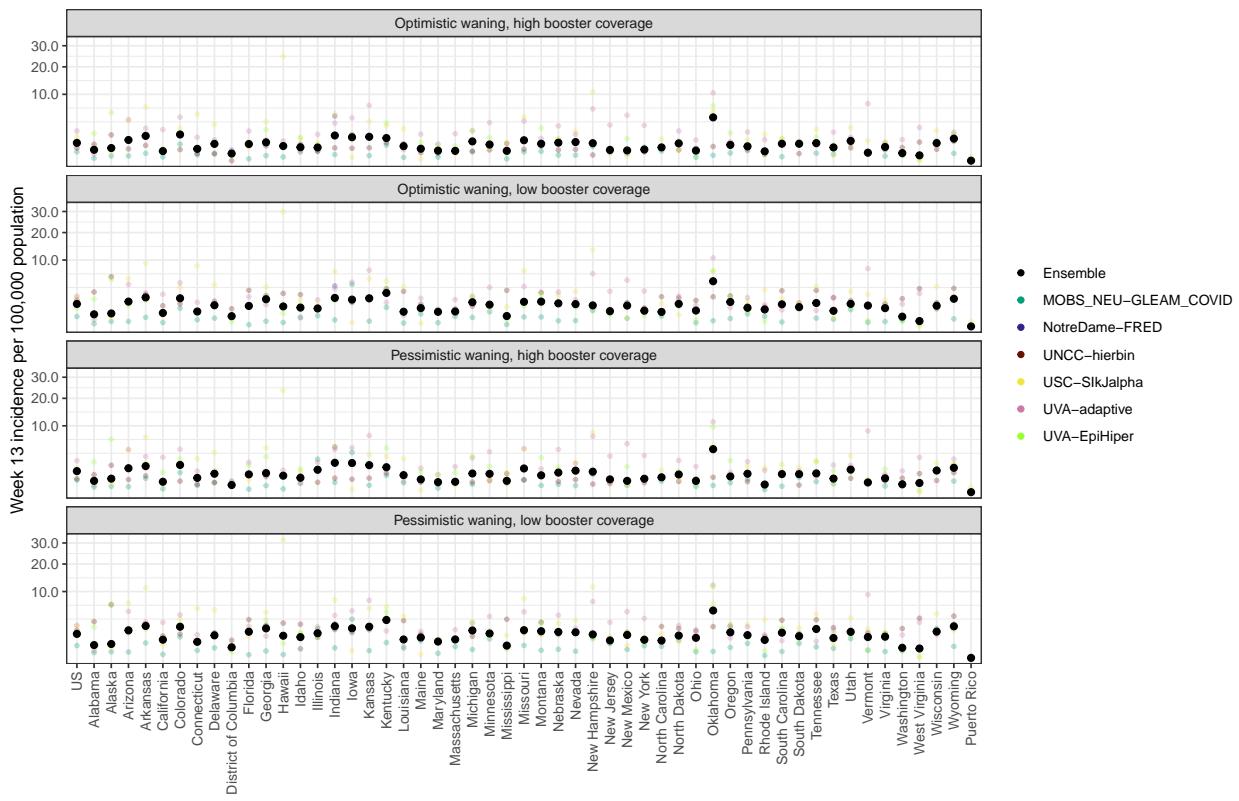
### State variation – Deaths



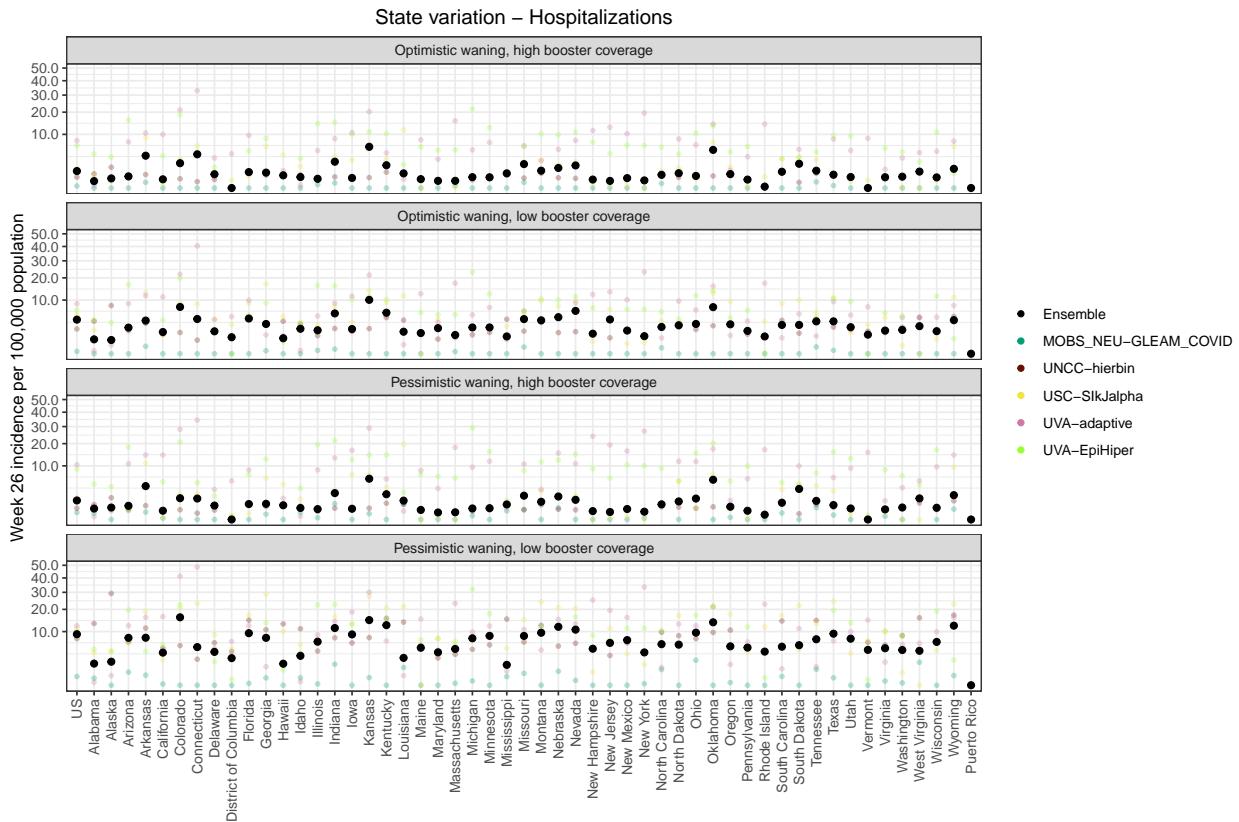
Individual model and ensembles projections for state-level death and hospitalization incidence per 100,000 population at week 13.

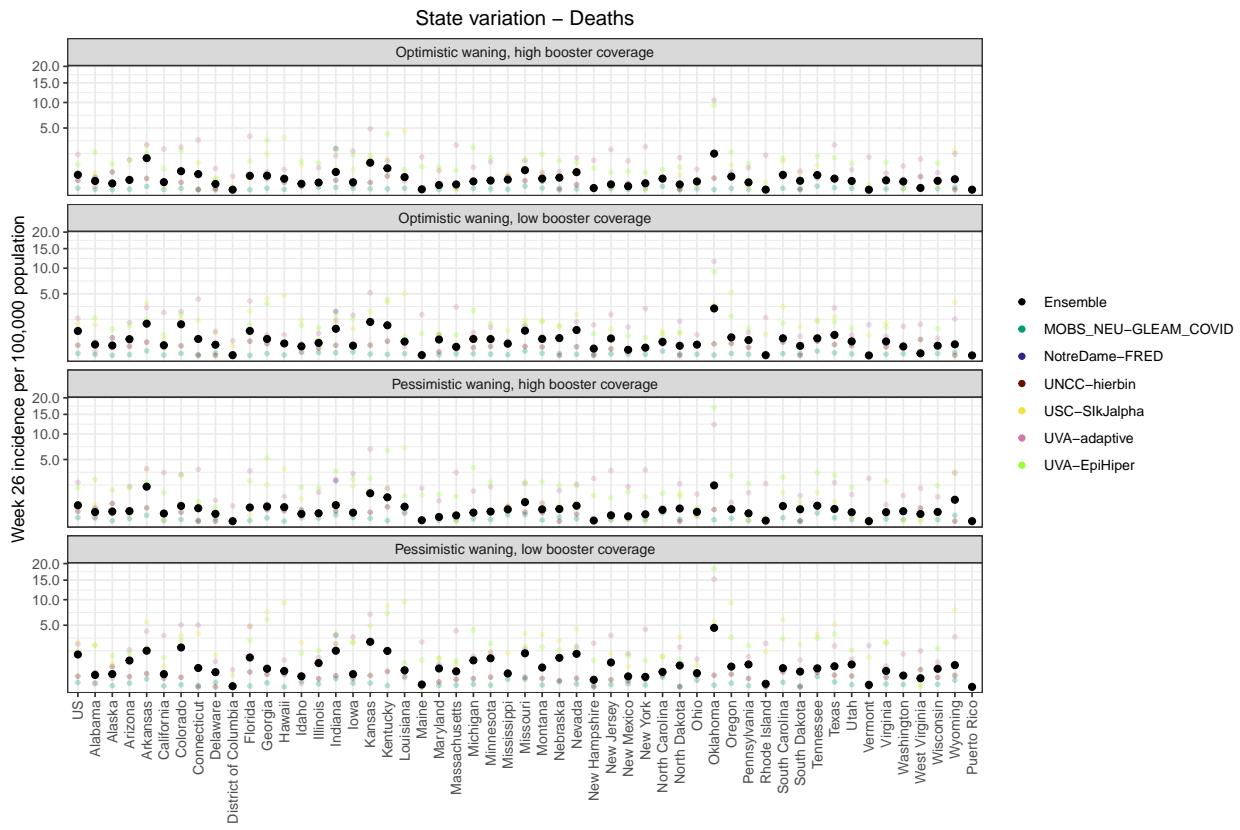


### State variation – Deaths

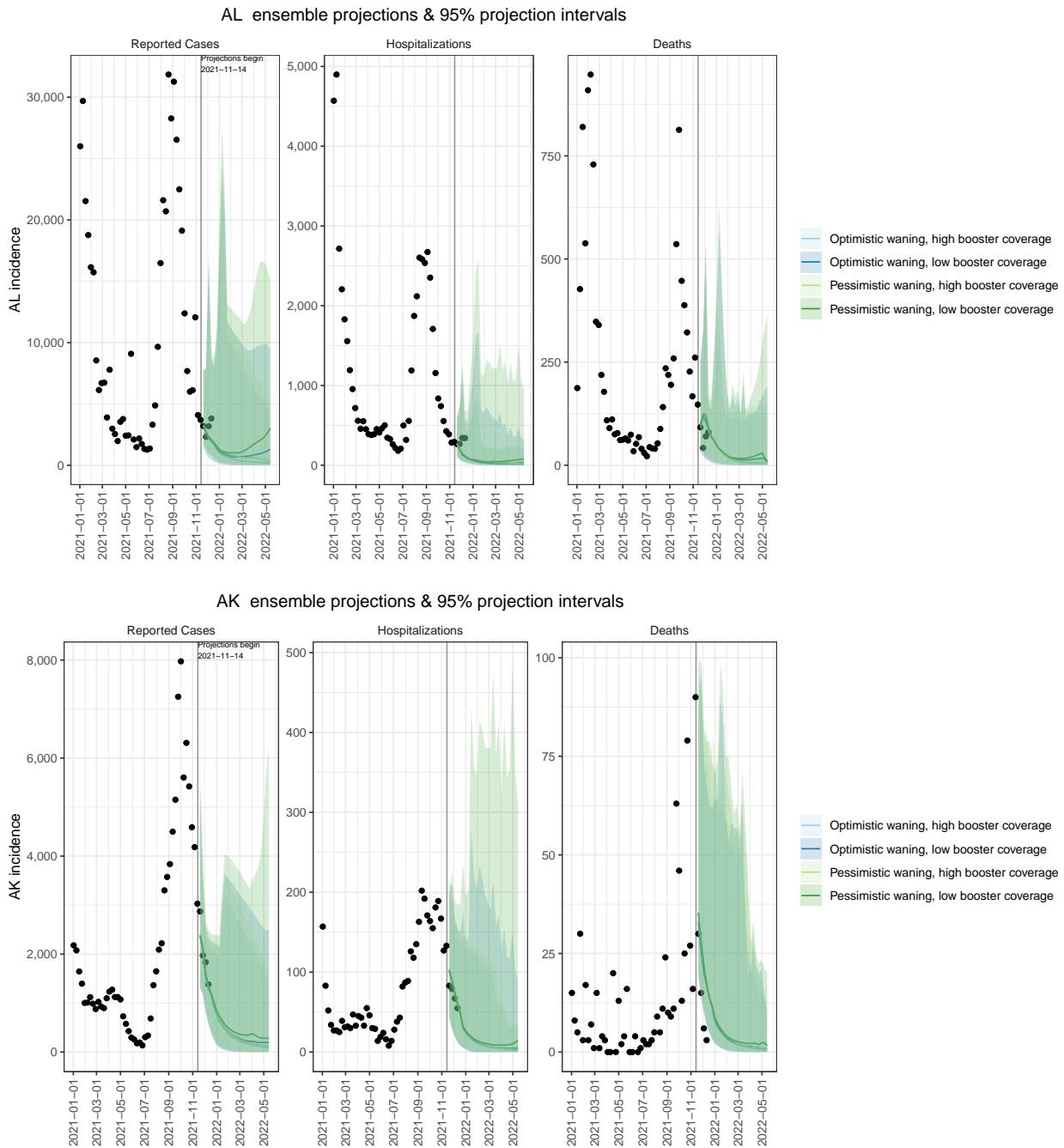


Individual model and ensembles projections for state-level incidence per 100,000 population at week 26.

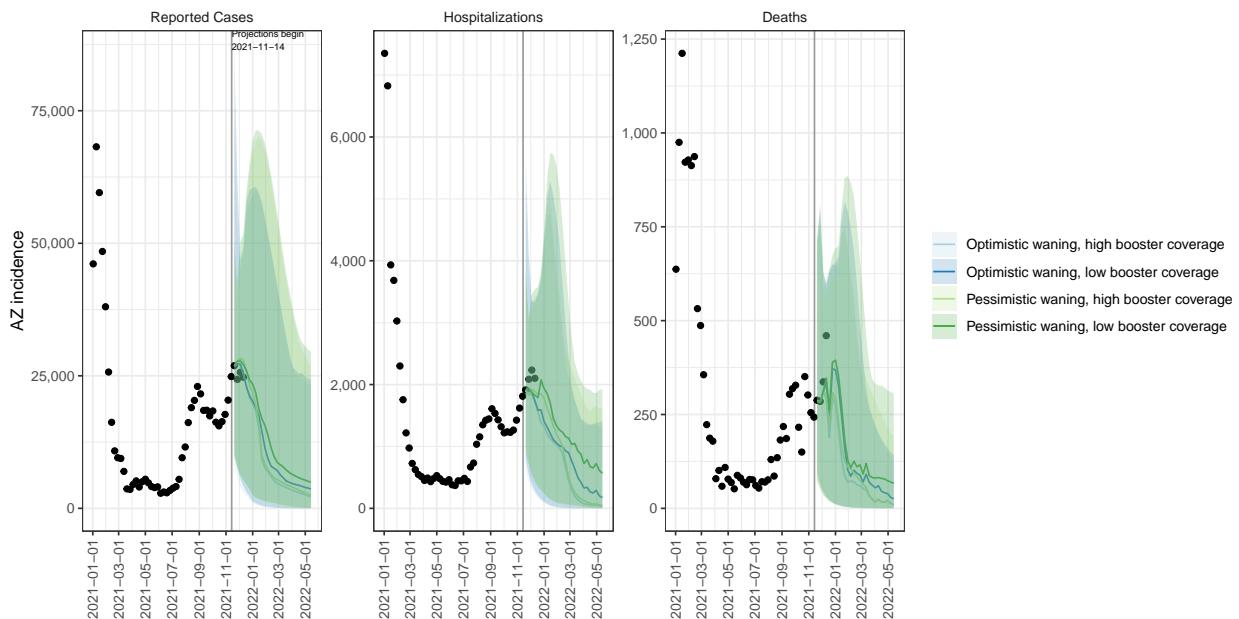




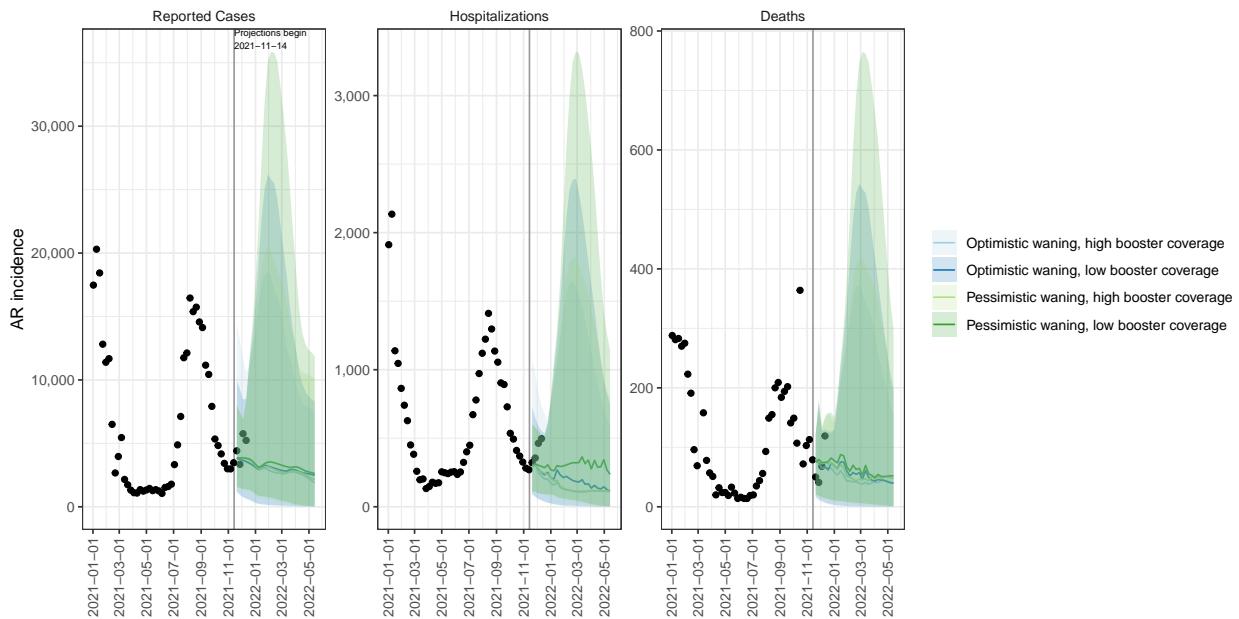
## State-level ensemble plots



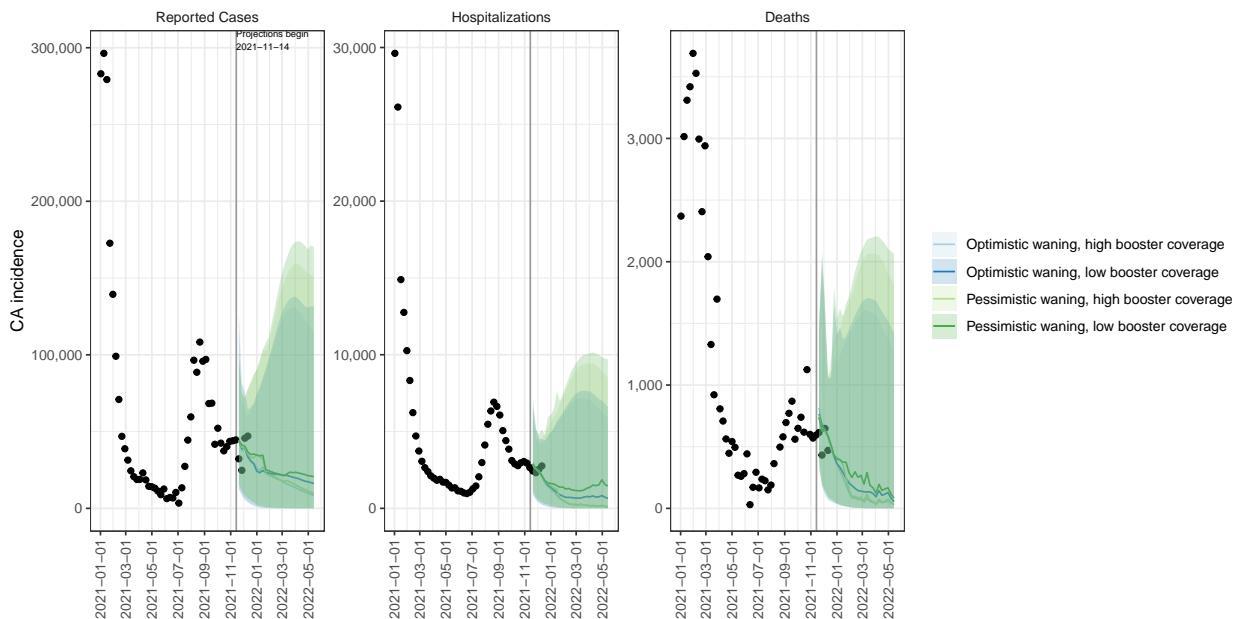
### AZ ensemble projections & 95% projection intervals



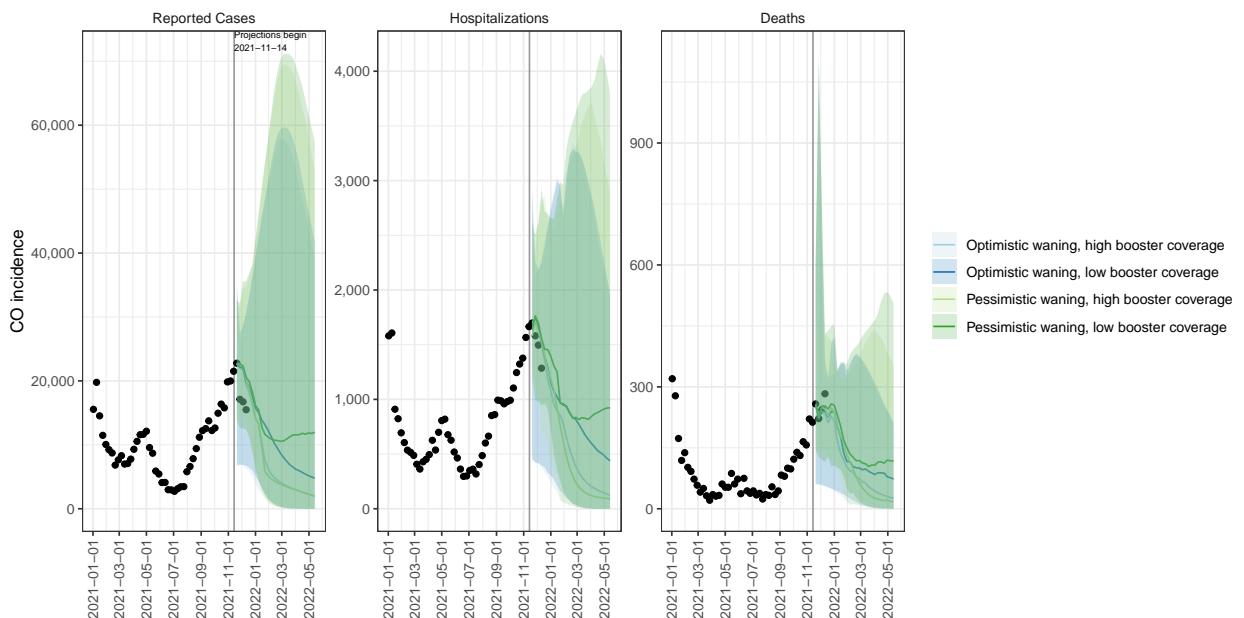
### AR ensemble projections & 95% projection intervals



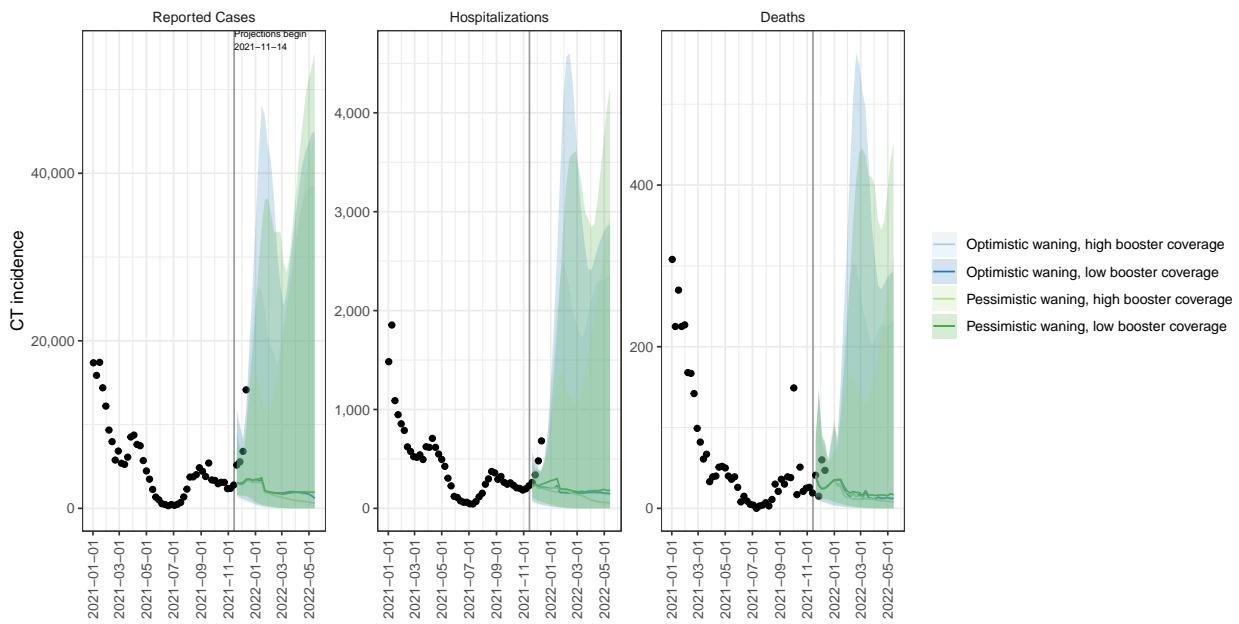
### CA ensemble projections & 95% projection intervals



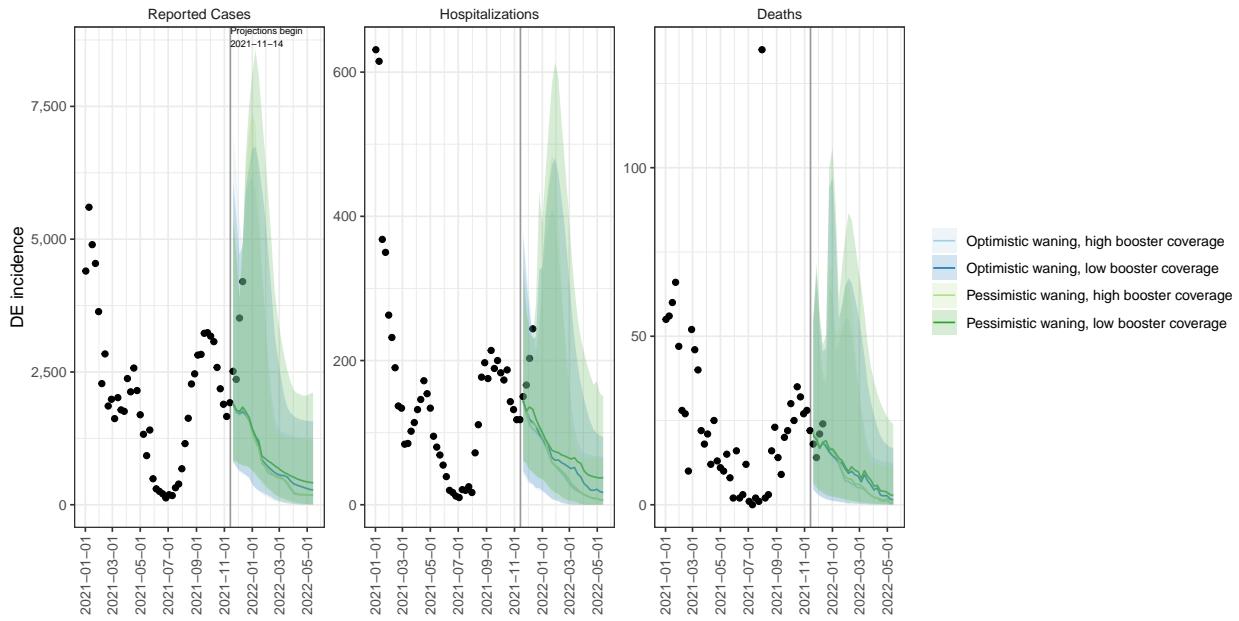
### CO ensemble projections & 95% projection intervals



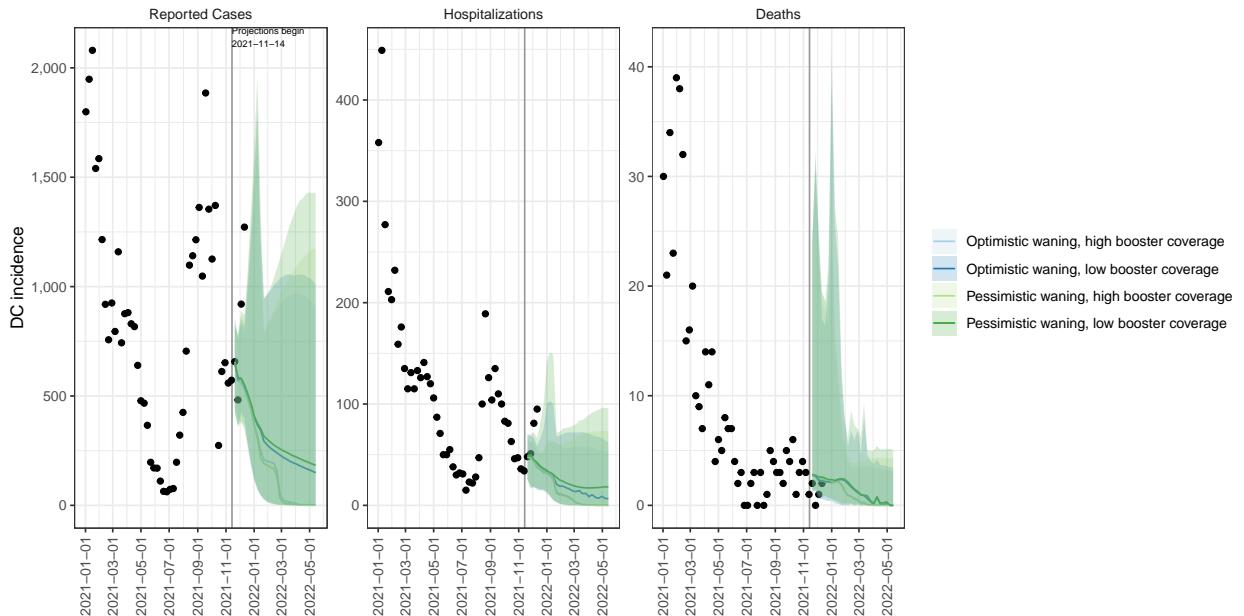
### CT ensemble projections & 95% projection intervals



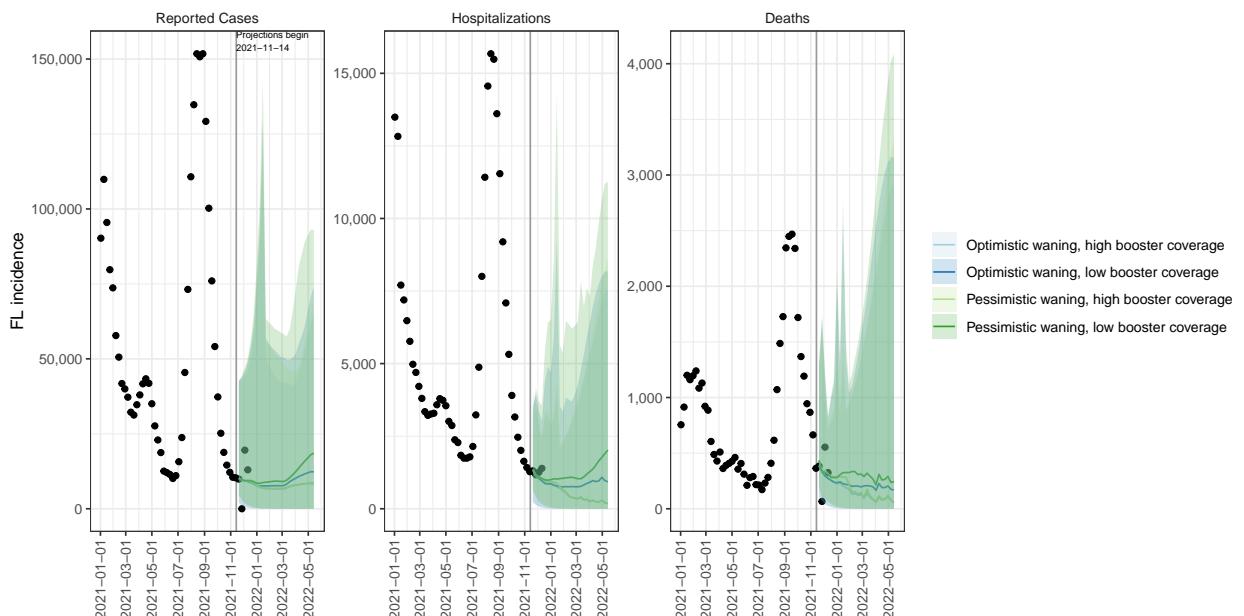
### DE ensemble projections & 95% projection intervals



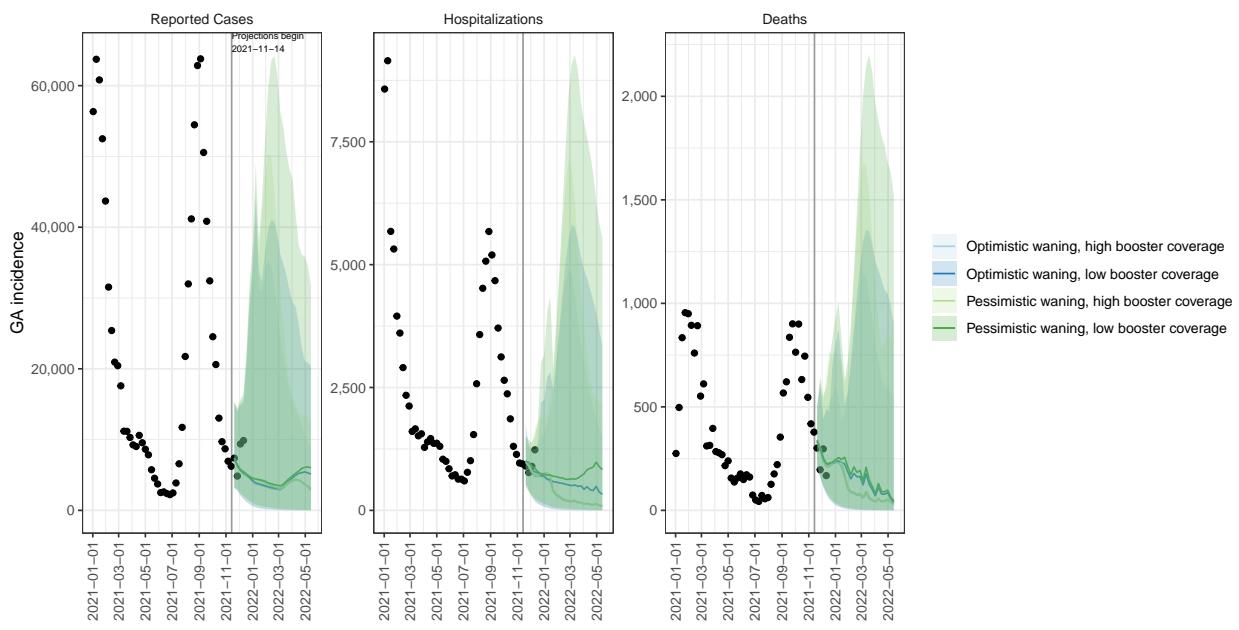
### DC ensemble projections & 95% projection intervals



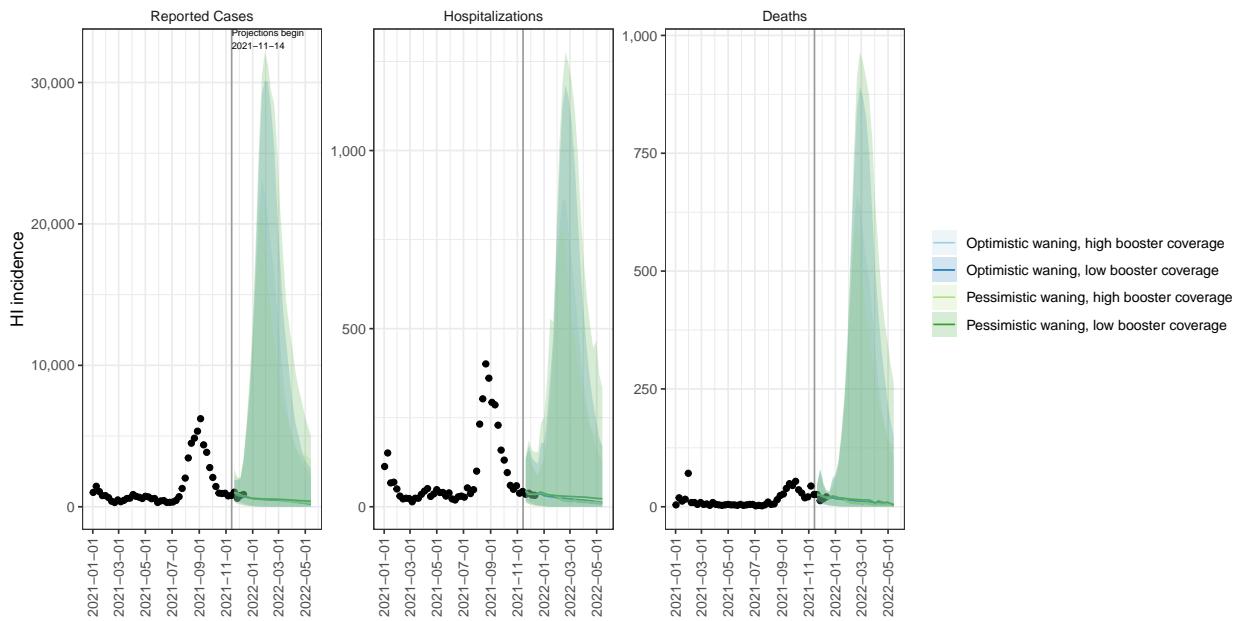
### FL ensemble projections & 95% projection intervals



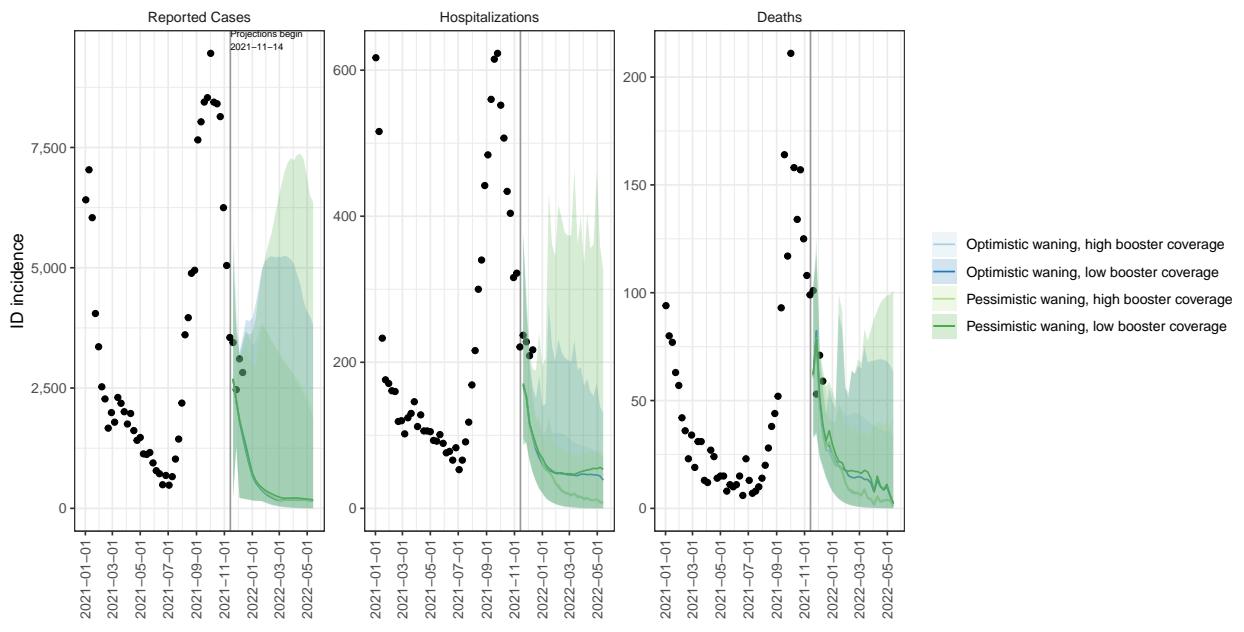
### GA ensemble projections & 95% projection intervals



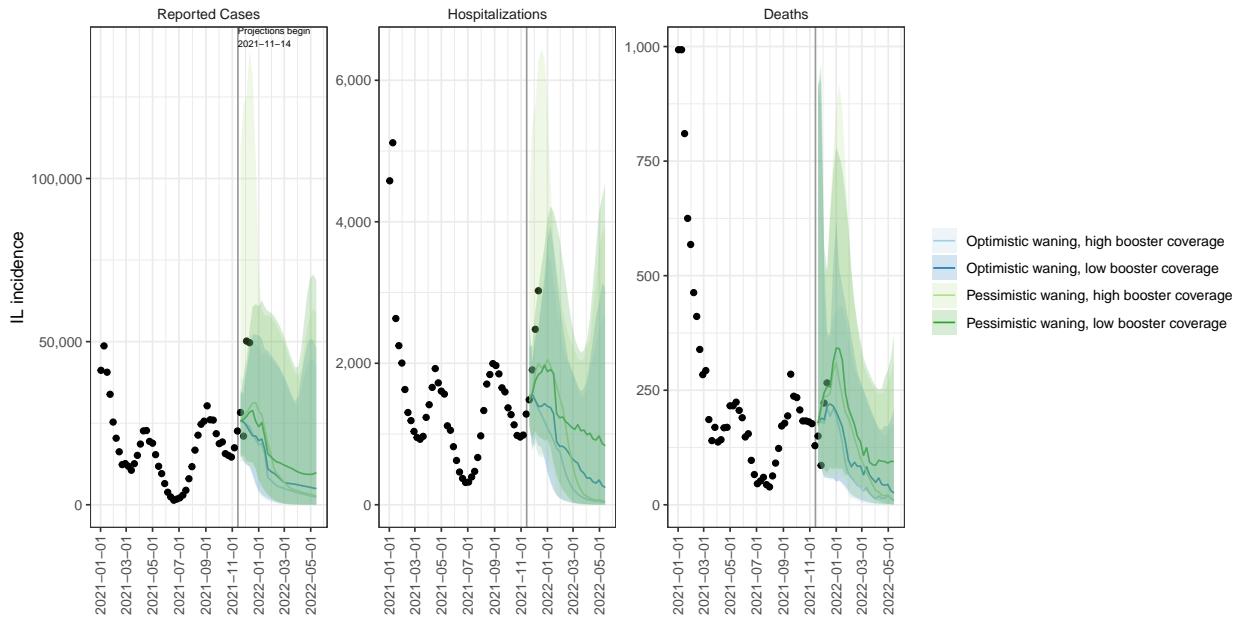
### HI ensemble projections & 95% projection intervals



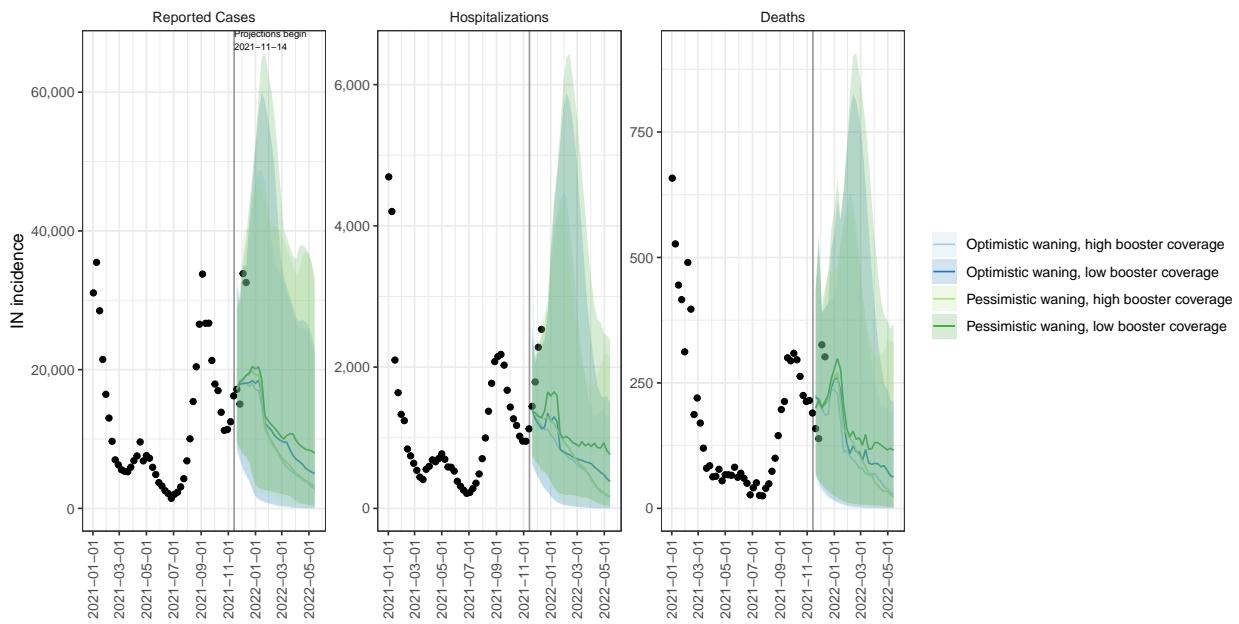
### ID ensemble projections & 95% projection intervals



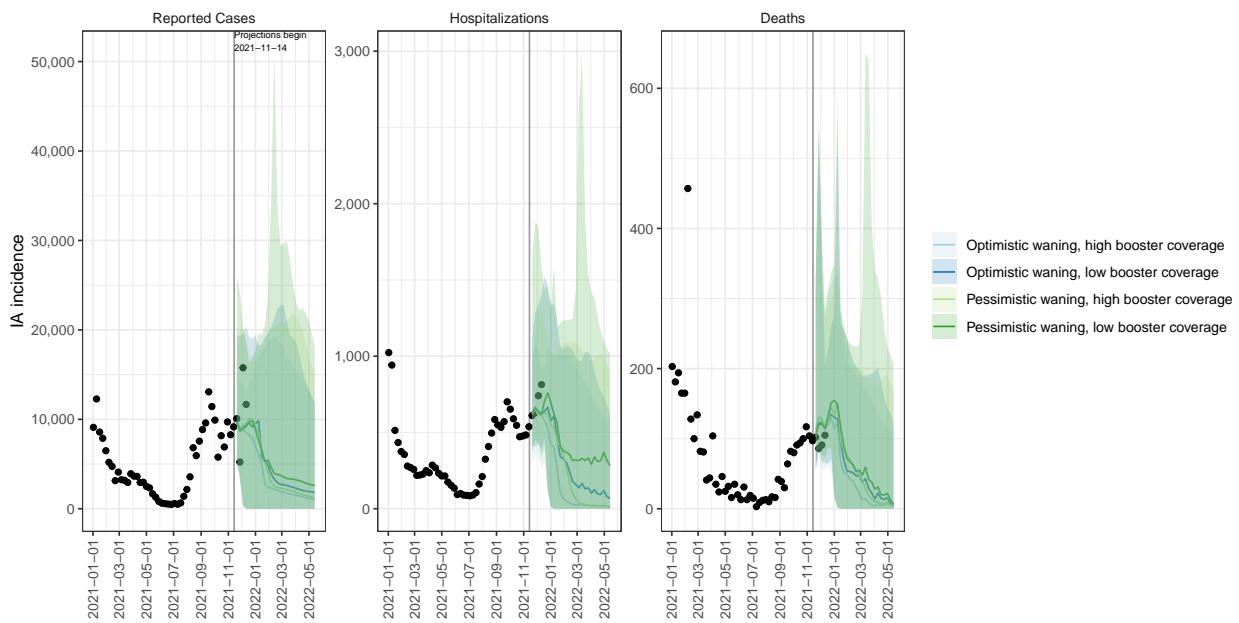
### IL ensemble projections & 95% projection intervals



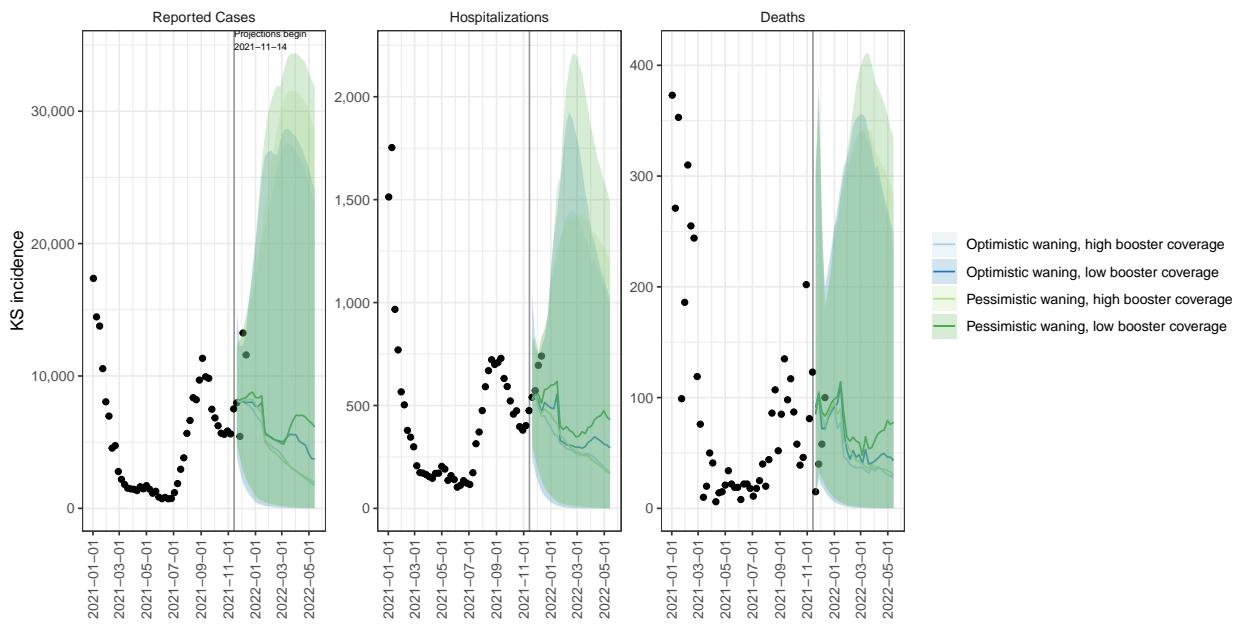
### IN ensemble projections & 95% projection intervals



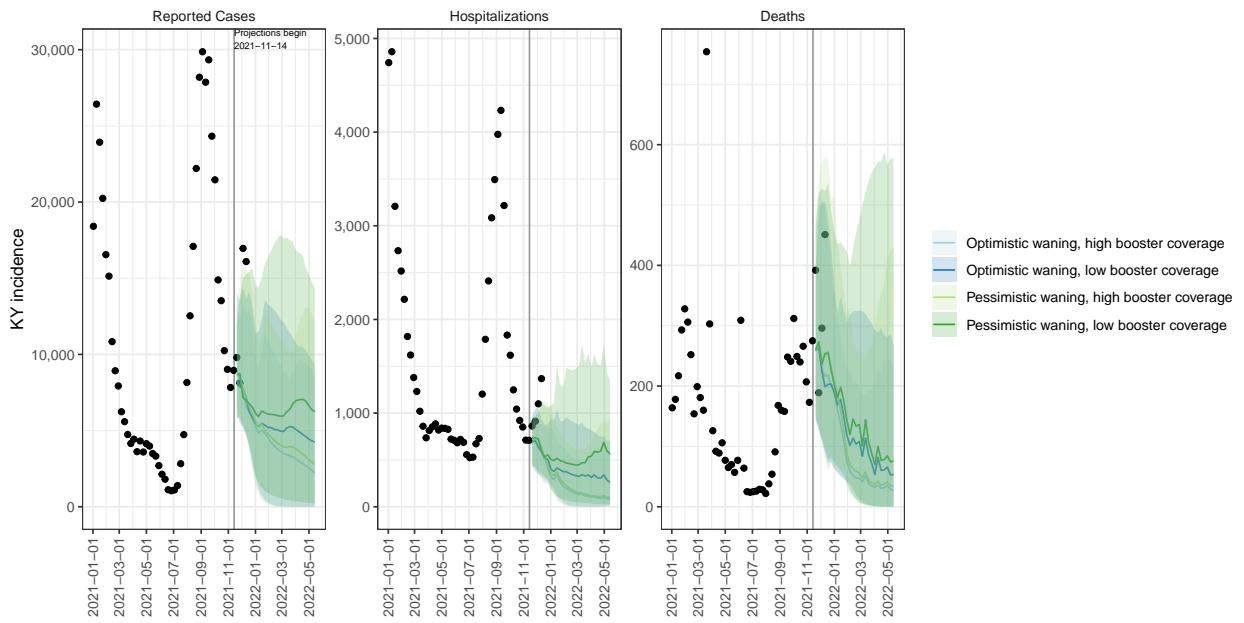
### IA ensemble projections & 95% projection intervals



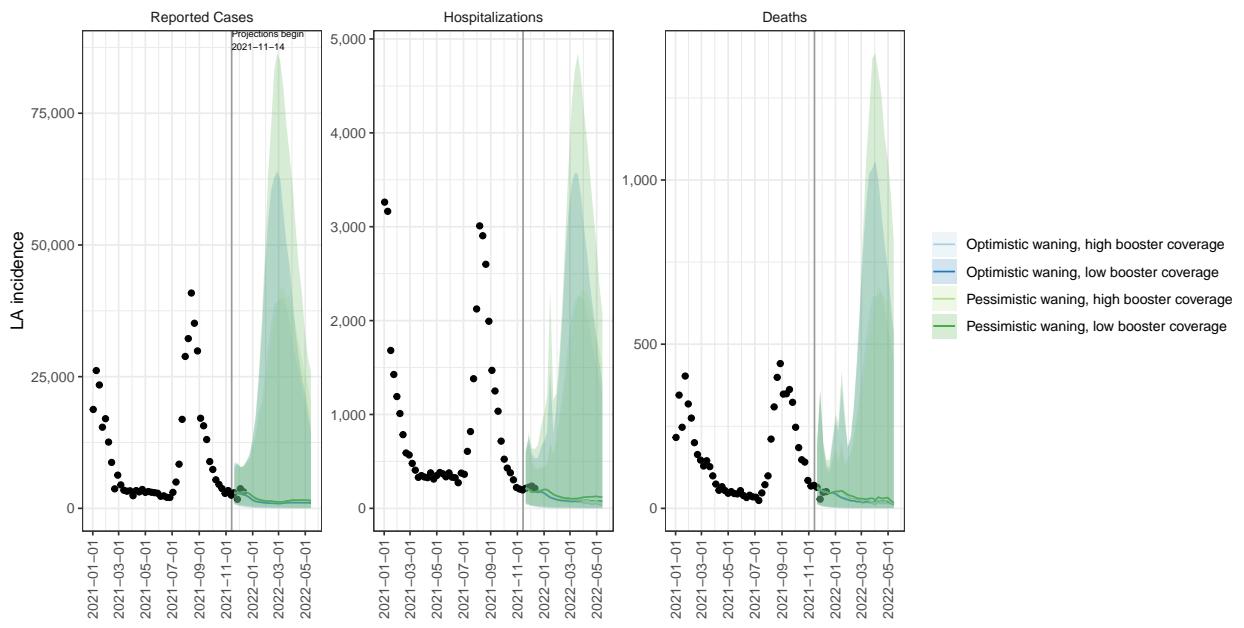
### KS ensemble projections & 95% projection intervals



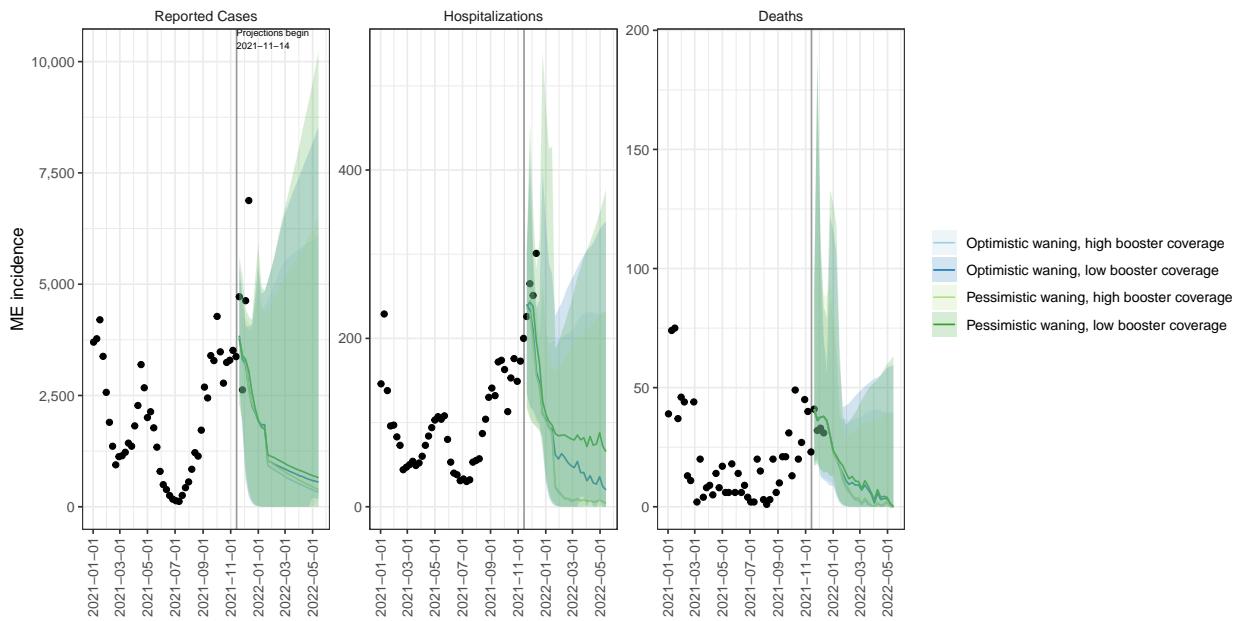
### KY ensemble projections & 95% projection intervals



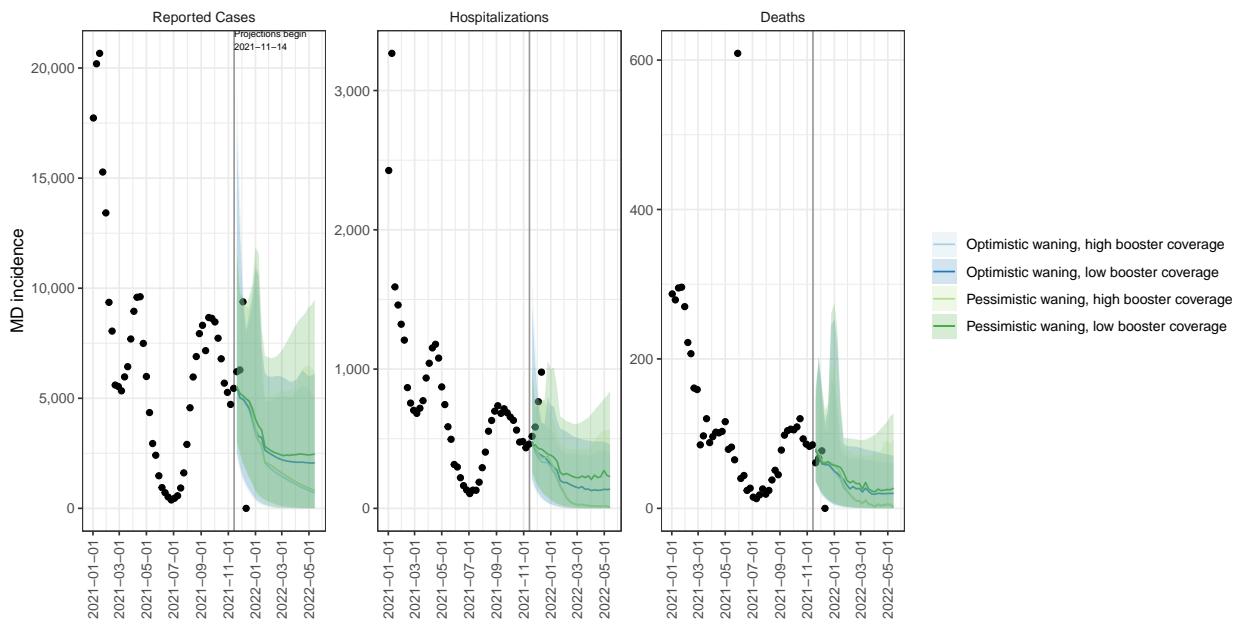
### LA ensemble projections & 95% projection intervals



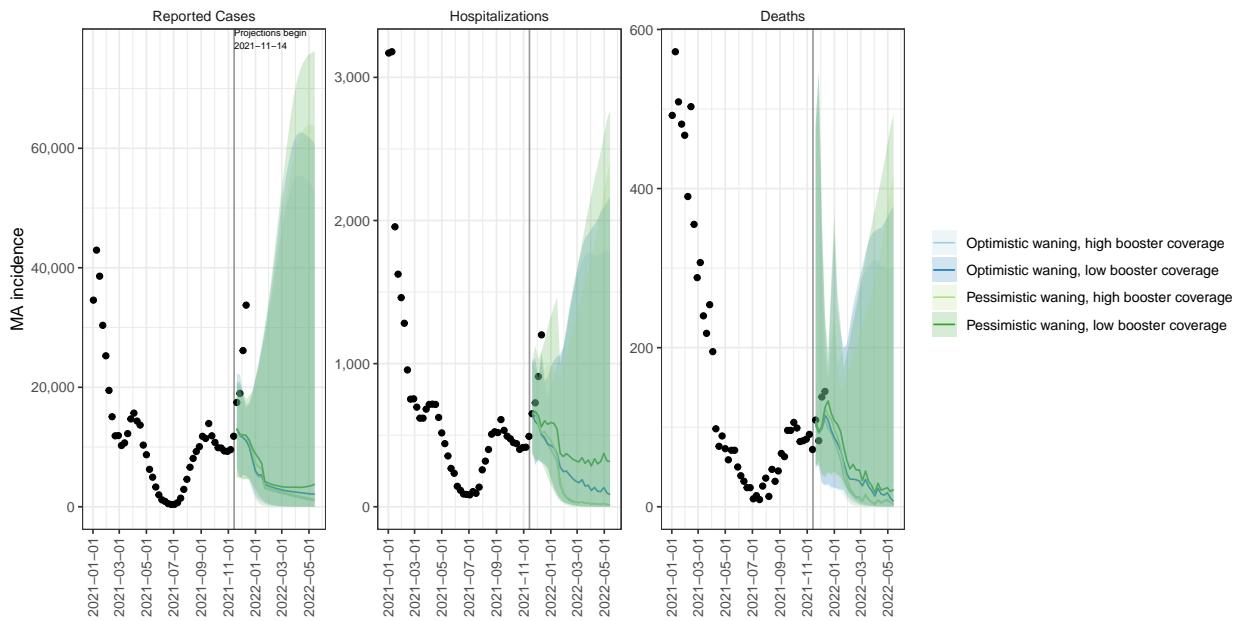
### ME ensemble projections & 95% projection intervals



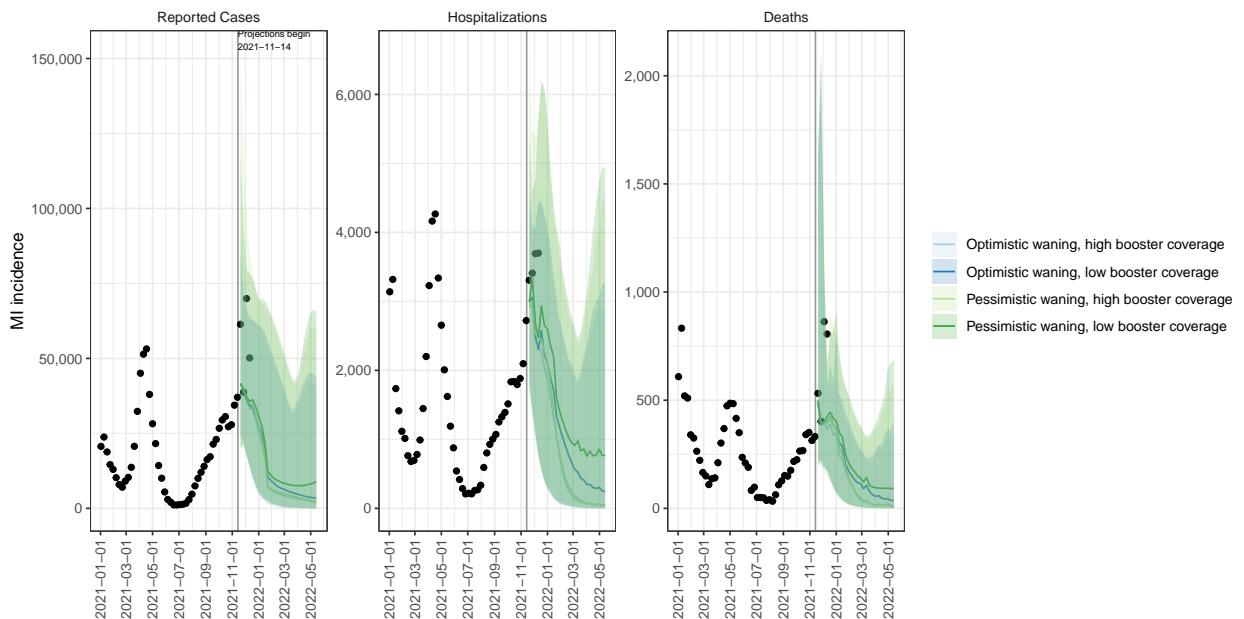
### MD ensemble projections & 95% projection intervals



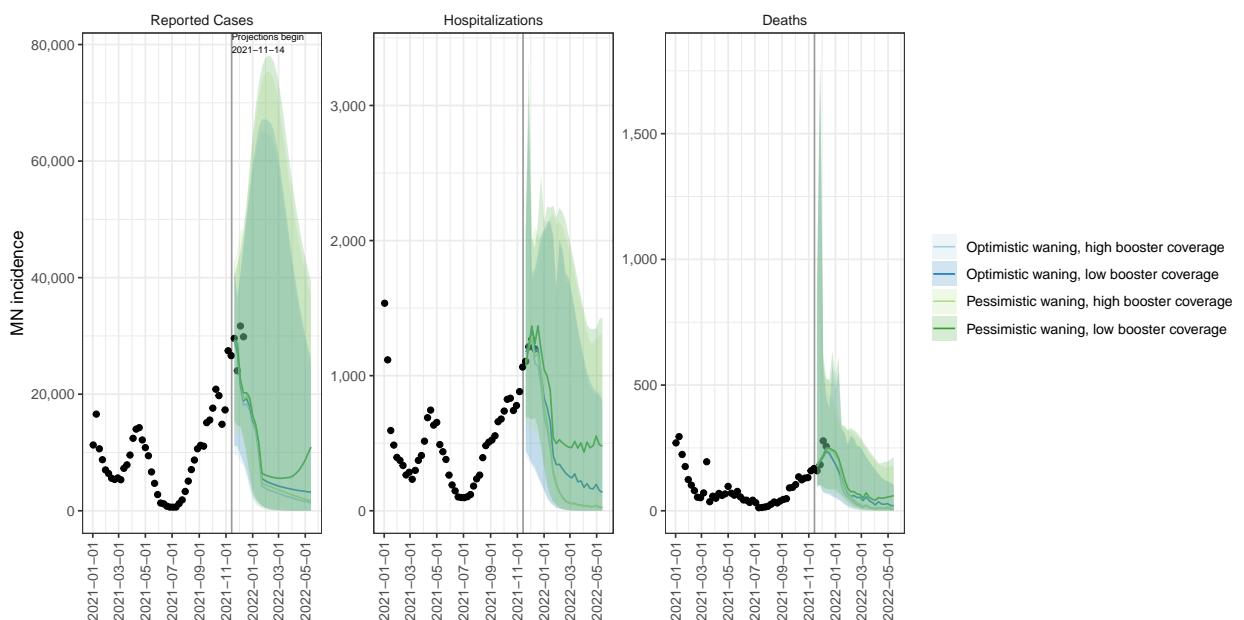
### MA ensemble projections & 95% projection intervals



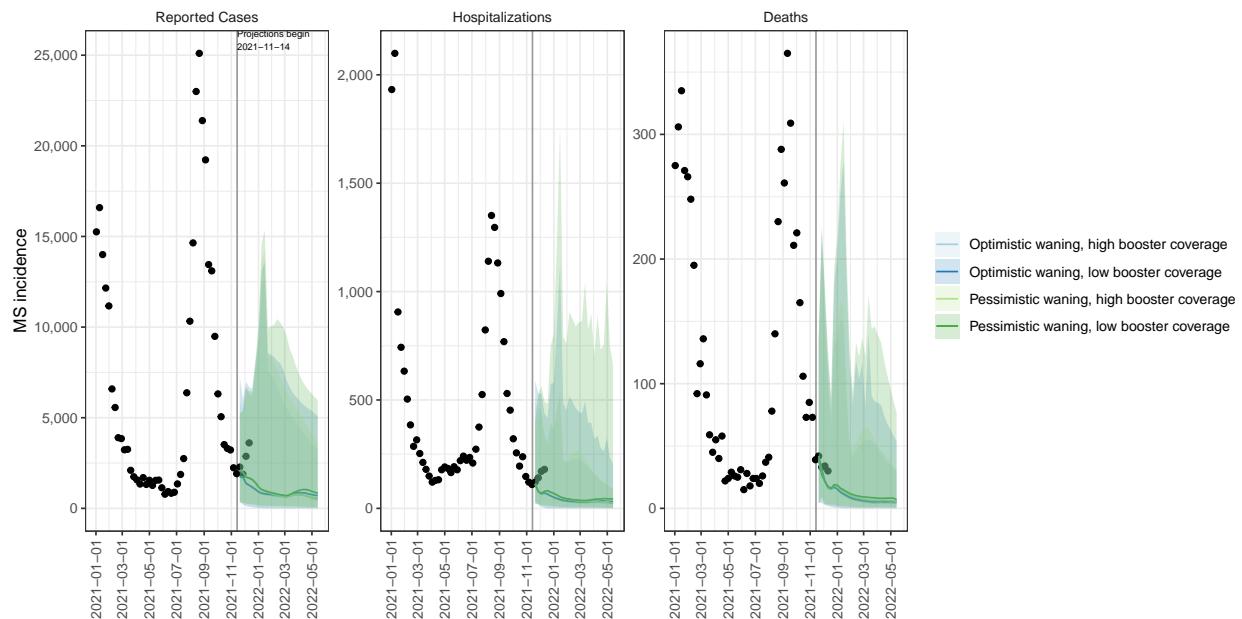
### MI ensemble projections & 95% projection intervals



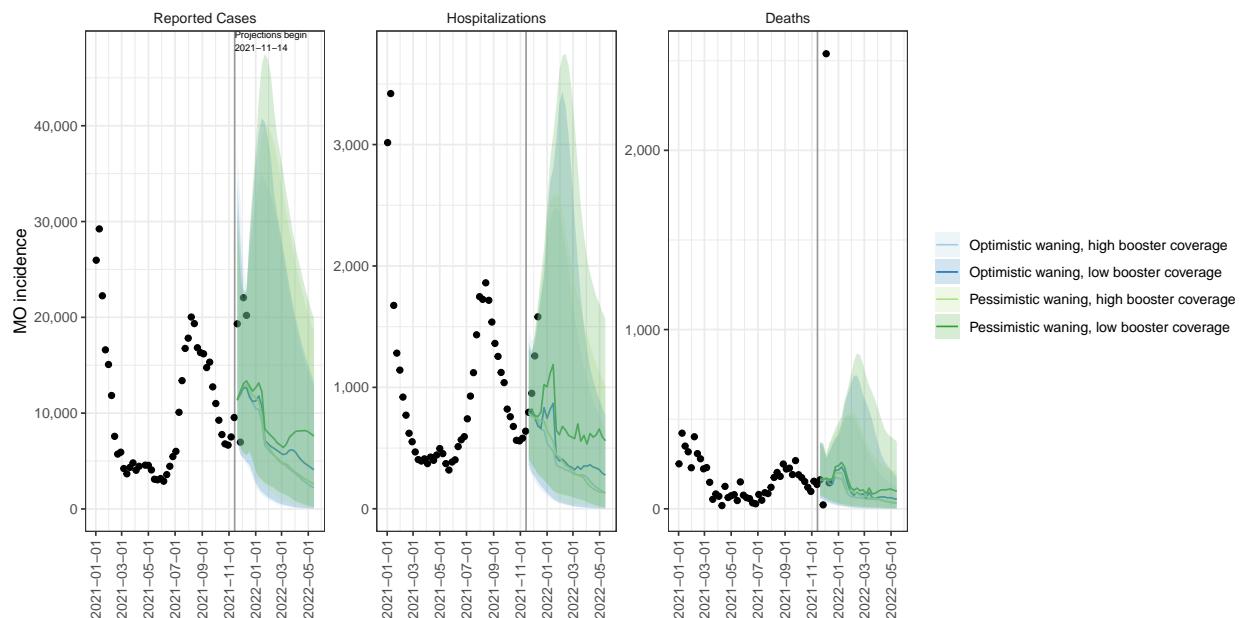
### MN ensemble projections & 95% projection intervals



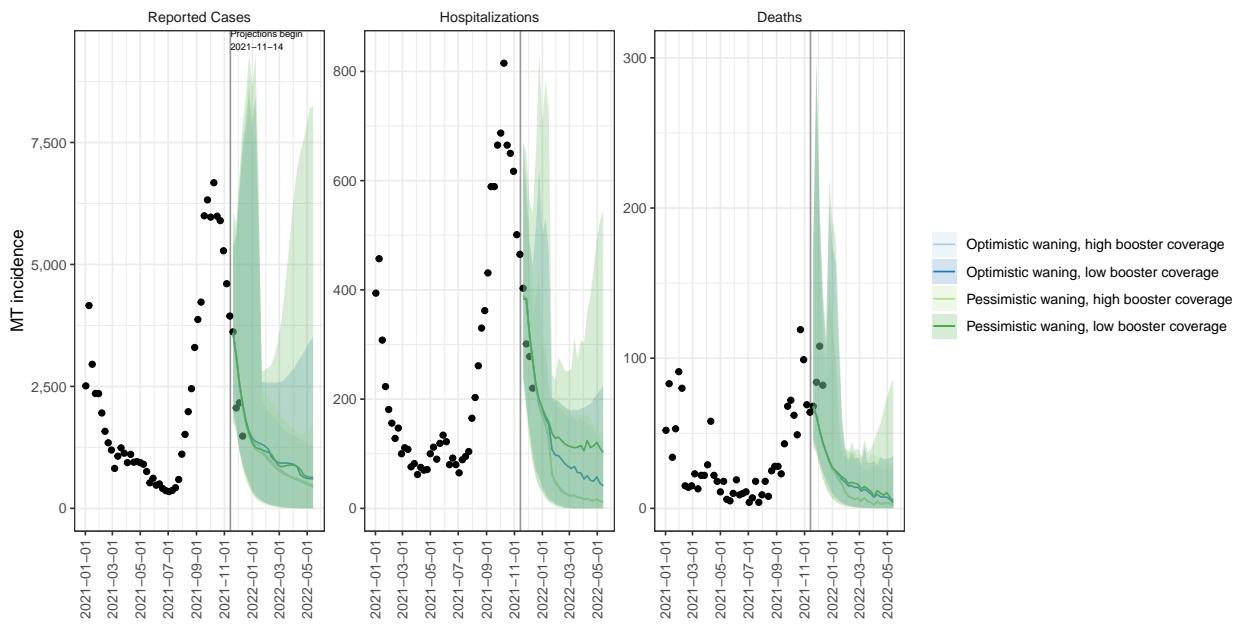
### MS ensemble projections & 95% projection intervals



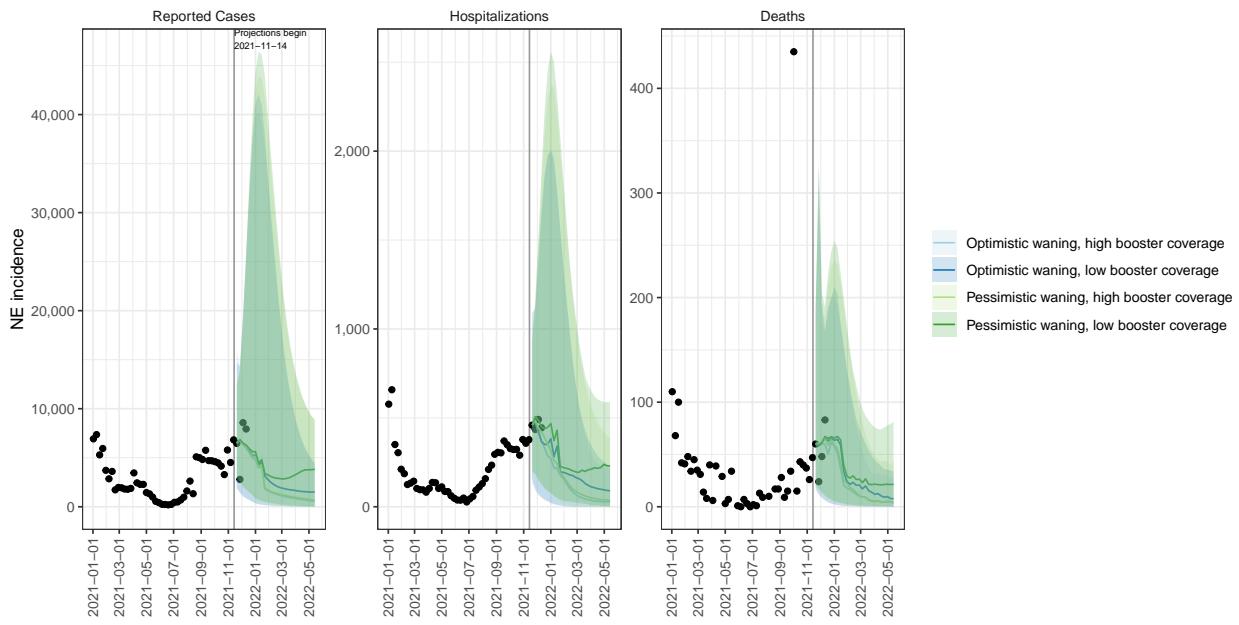
### MO ensemble projections & 95% projection intervals



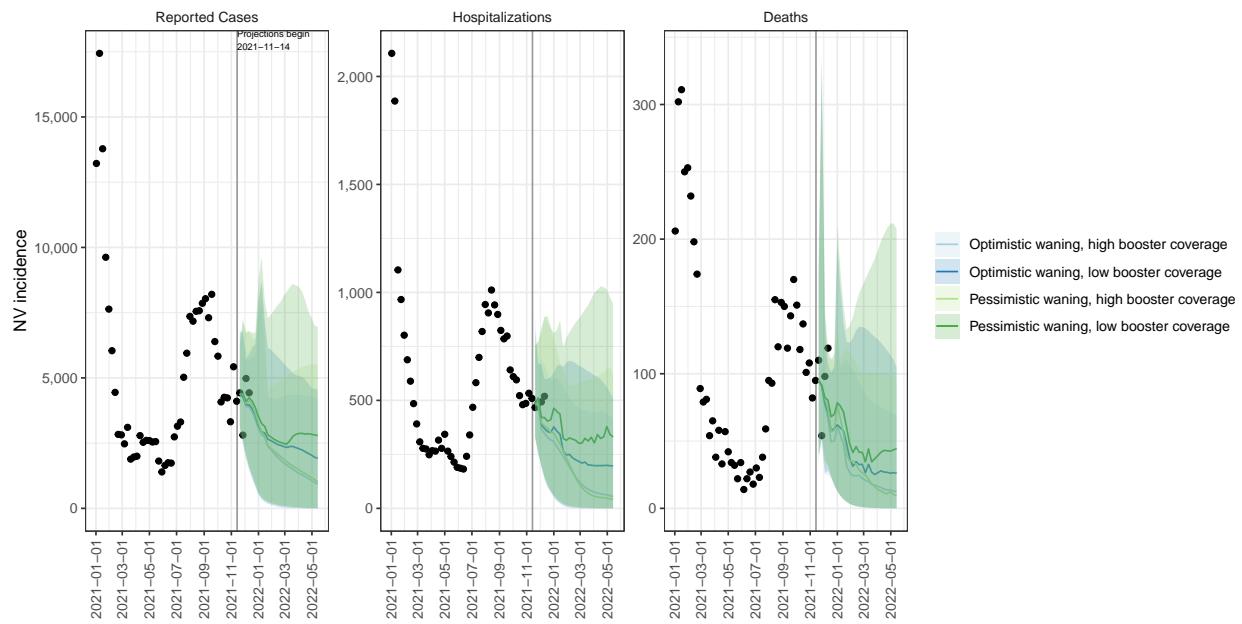
### MT ensemble projections & 95% projection intervals



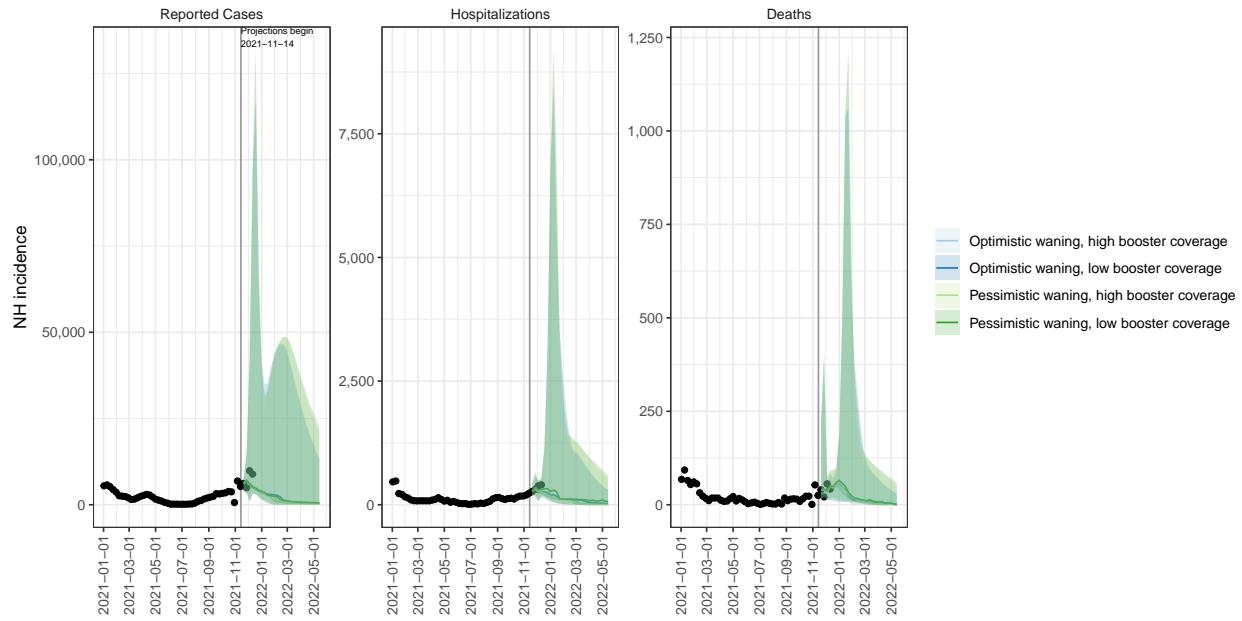
### NE ensemble projections & 95% projection intervals



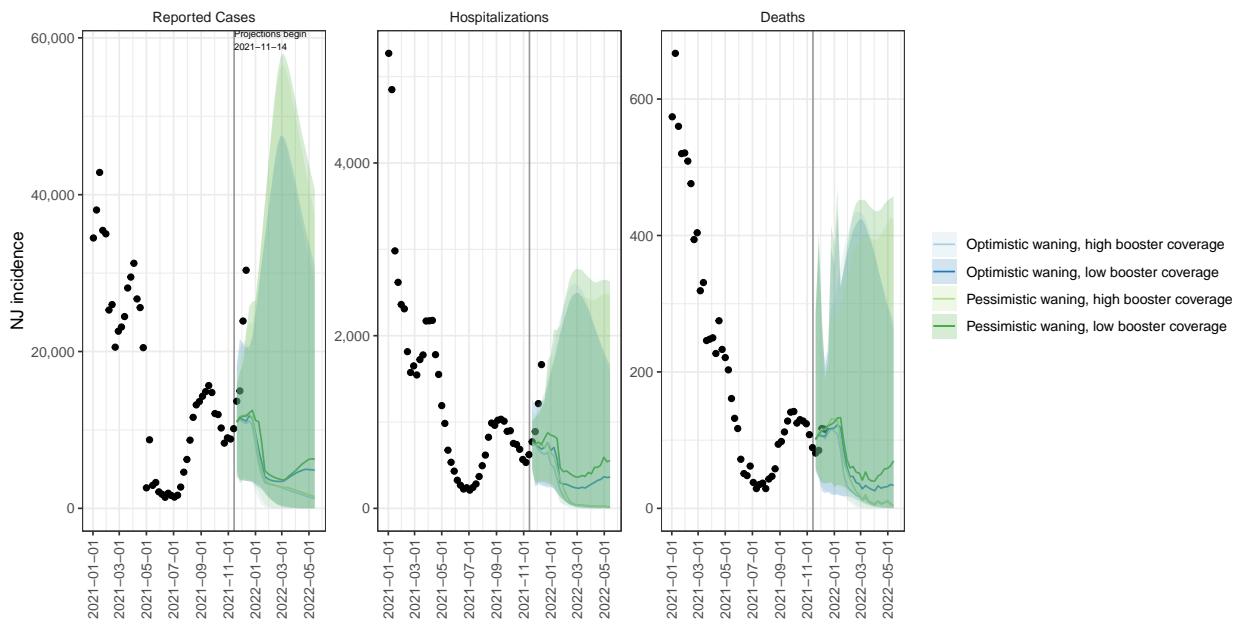
### NV ensemble projections & 95% projection intervals



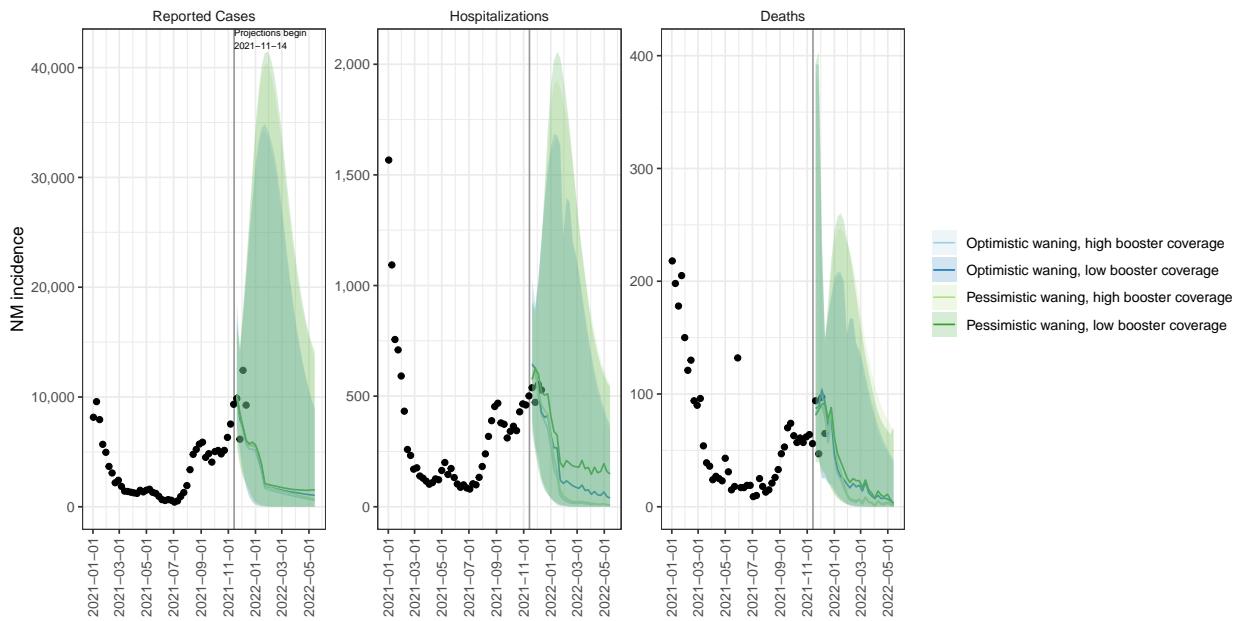
### NH ensemble projections & 95% projection intervals



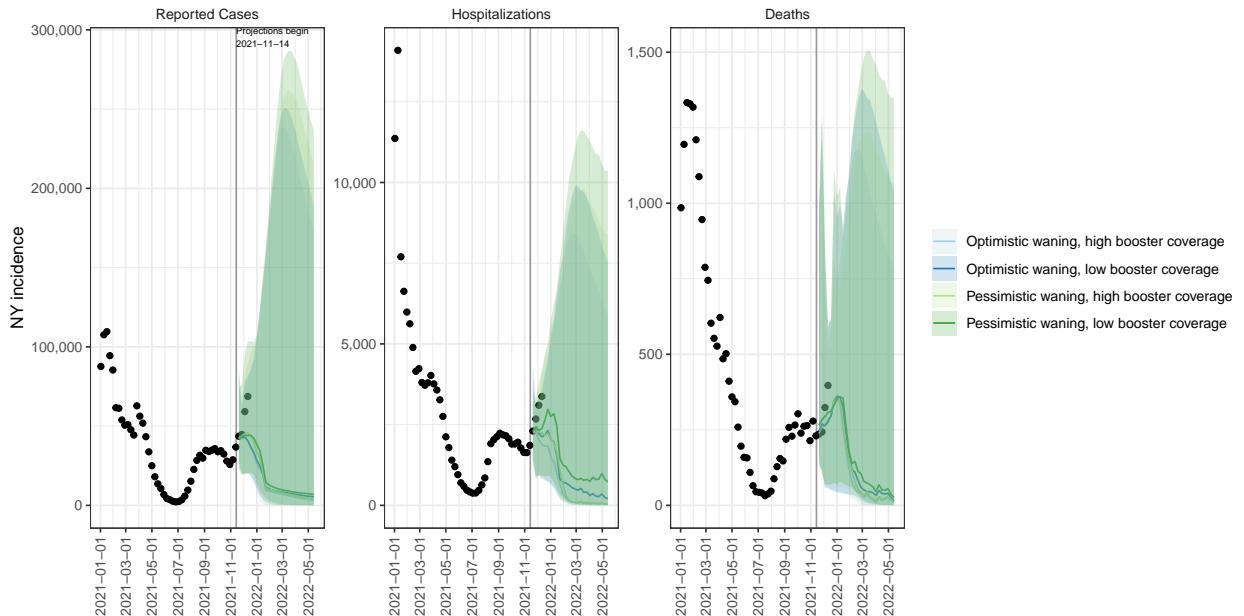
### NJ ensemble projections & 95% projection intervals



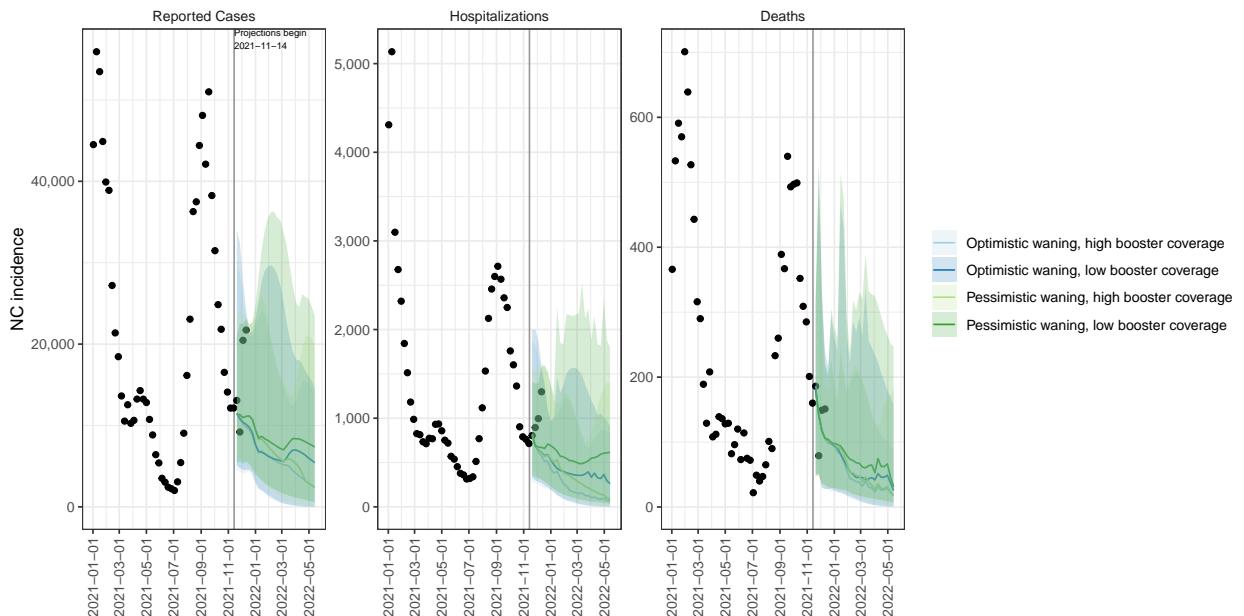
### NM ensemble projections & 95% projection intervals



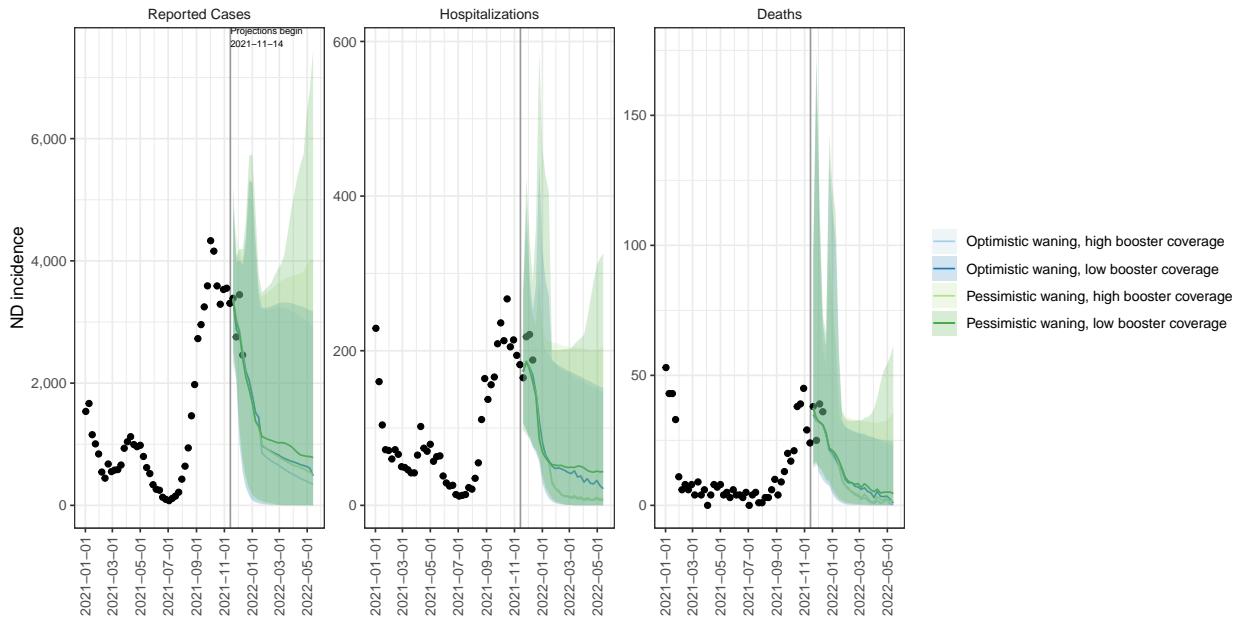
### NY ensemble projections & 95% projection intervals



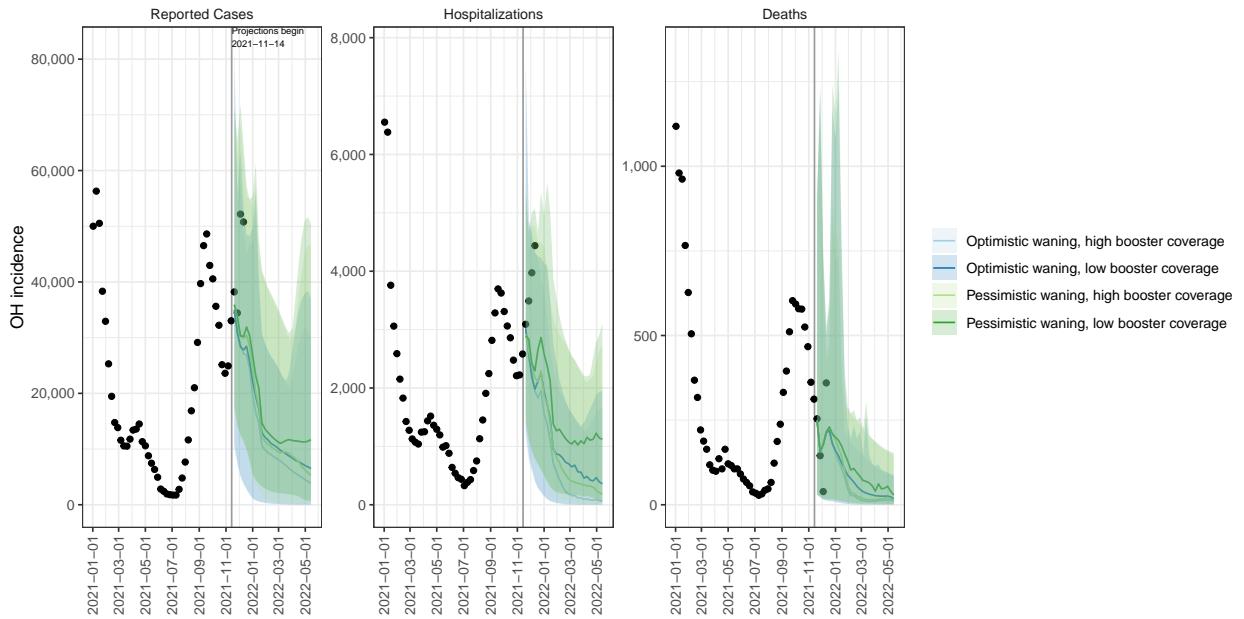
### NC ensemble projections & 95% projection intervals



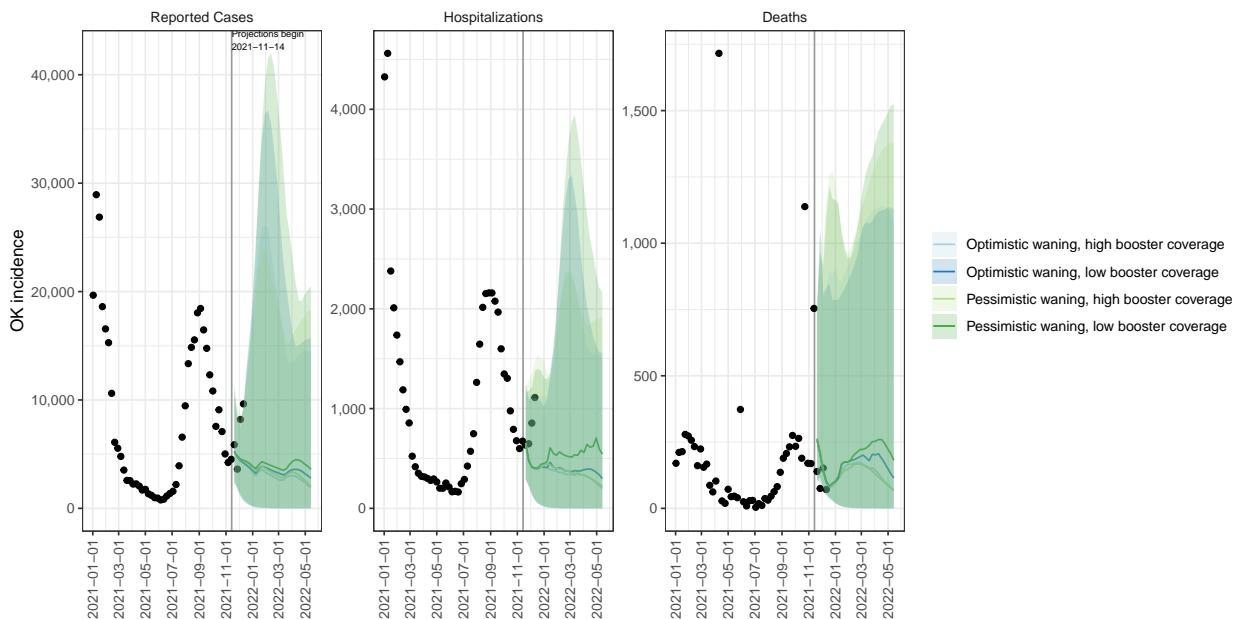
### ND ensemble projections & 95% projection intervals



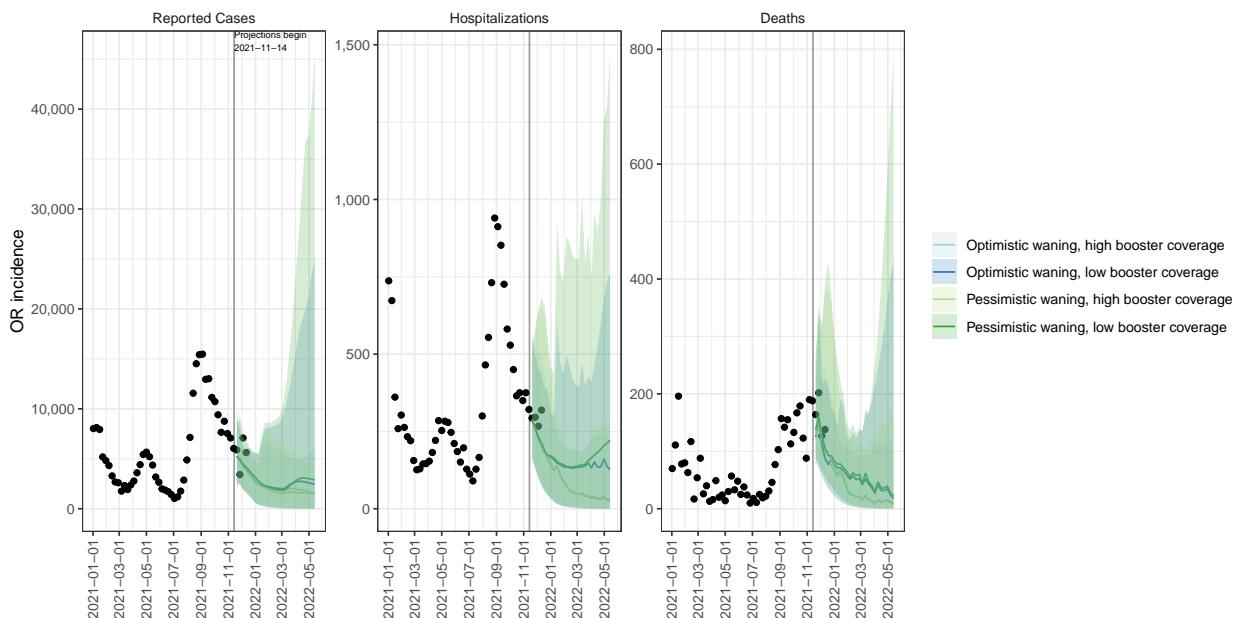
### OH ensemble projections & 95% projection intervals



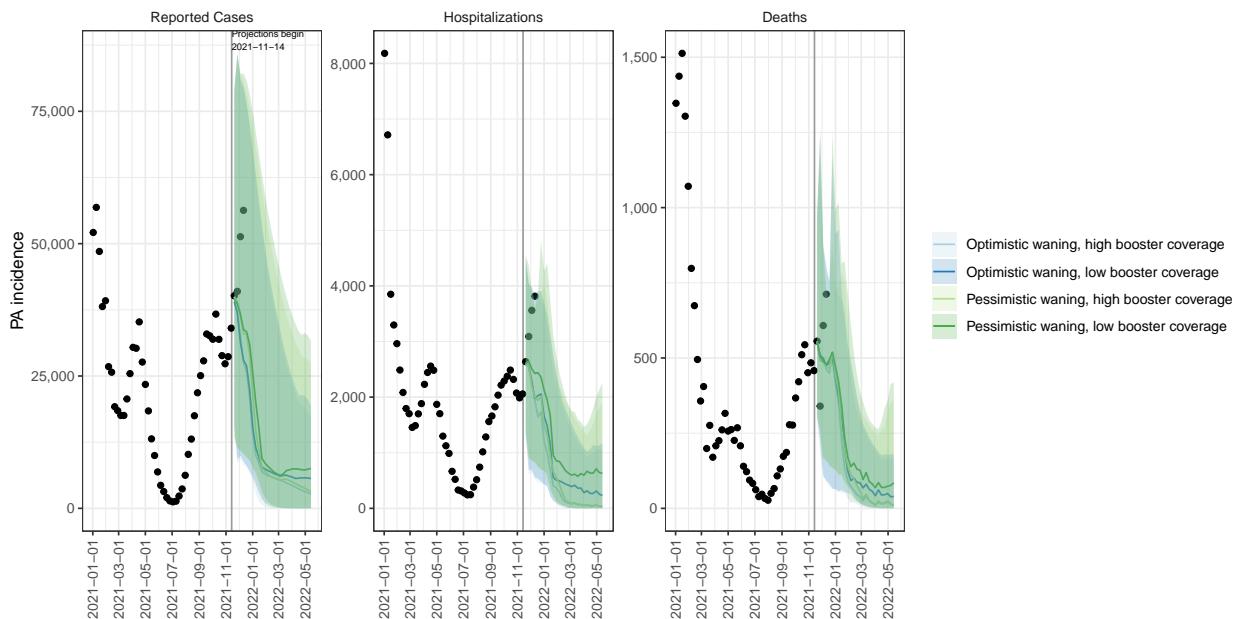
### OK ensemble projections & 95% projection intervals



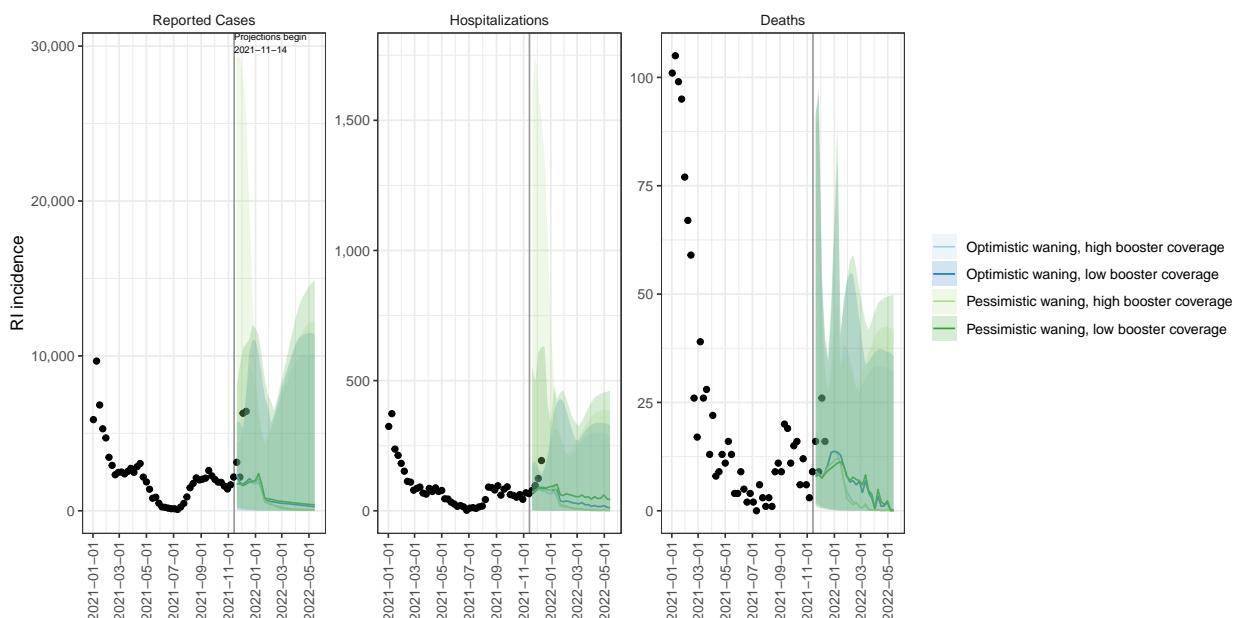
### OR ensemble projections & 95% projection intervals



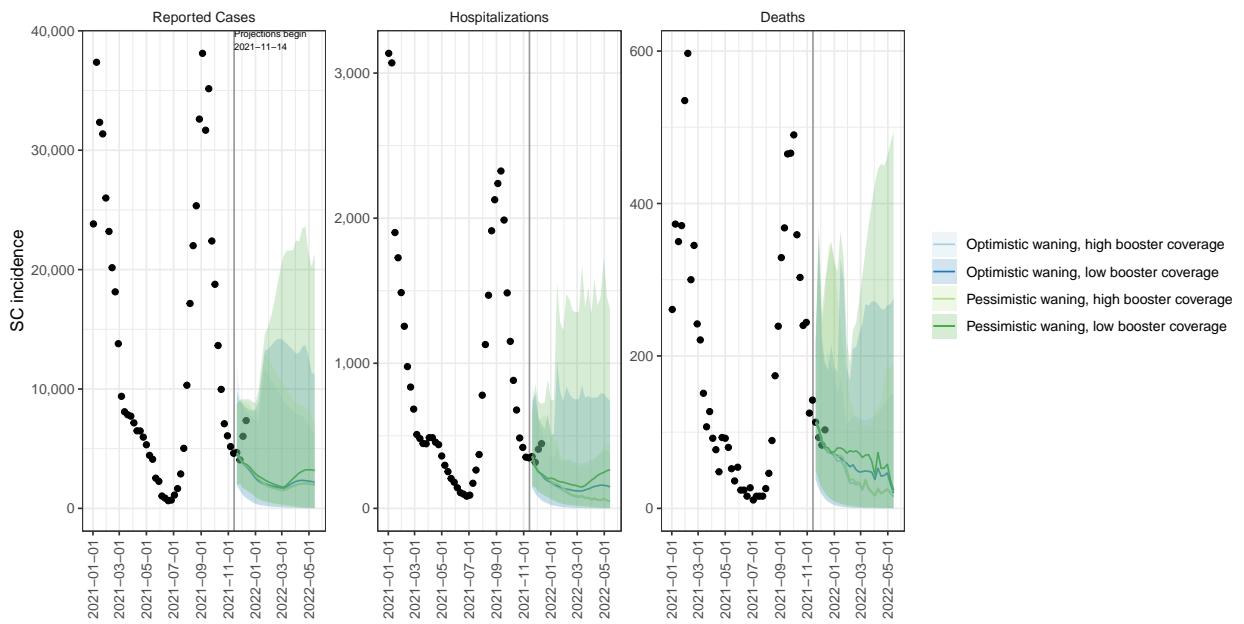
### PA ensemble projections & 95% projection intervals



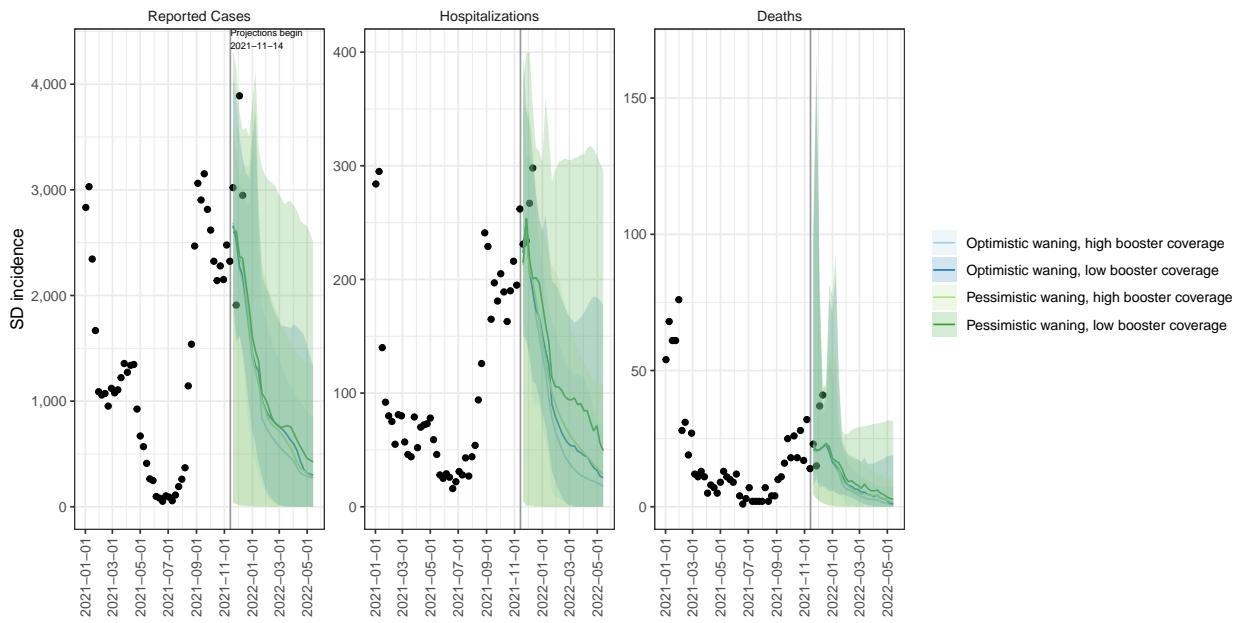
### RI ensemble projections & 95% projection intervals



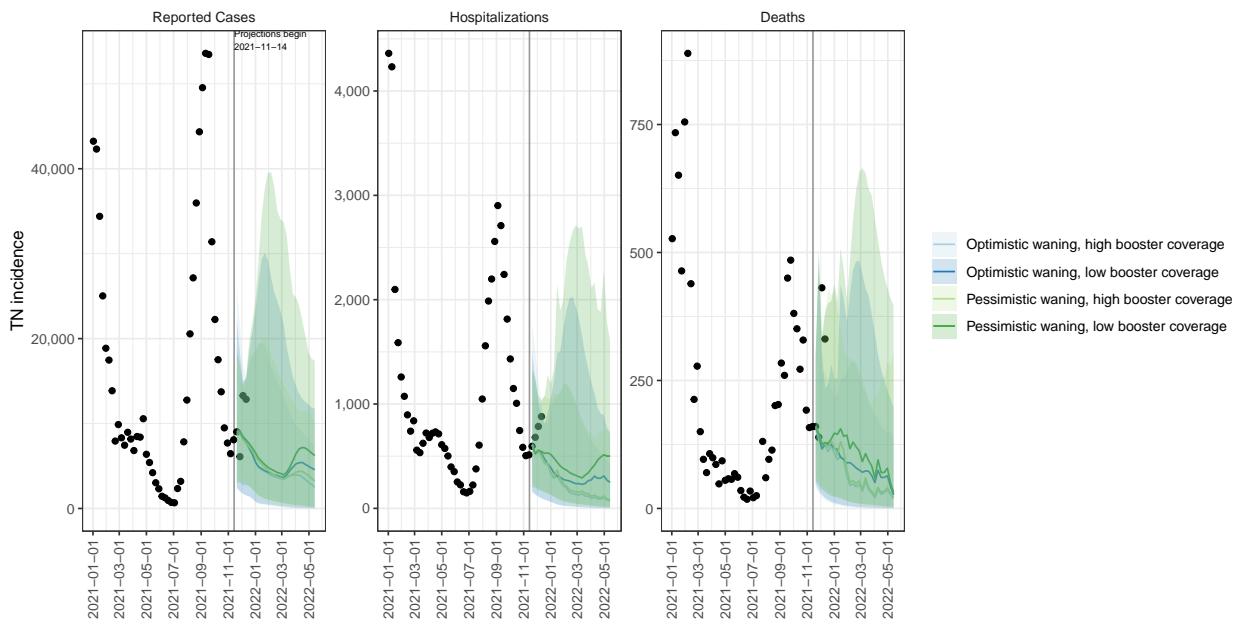
### SC ensemble projections & 95% projection intervals



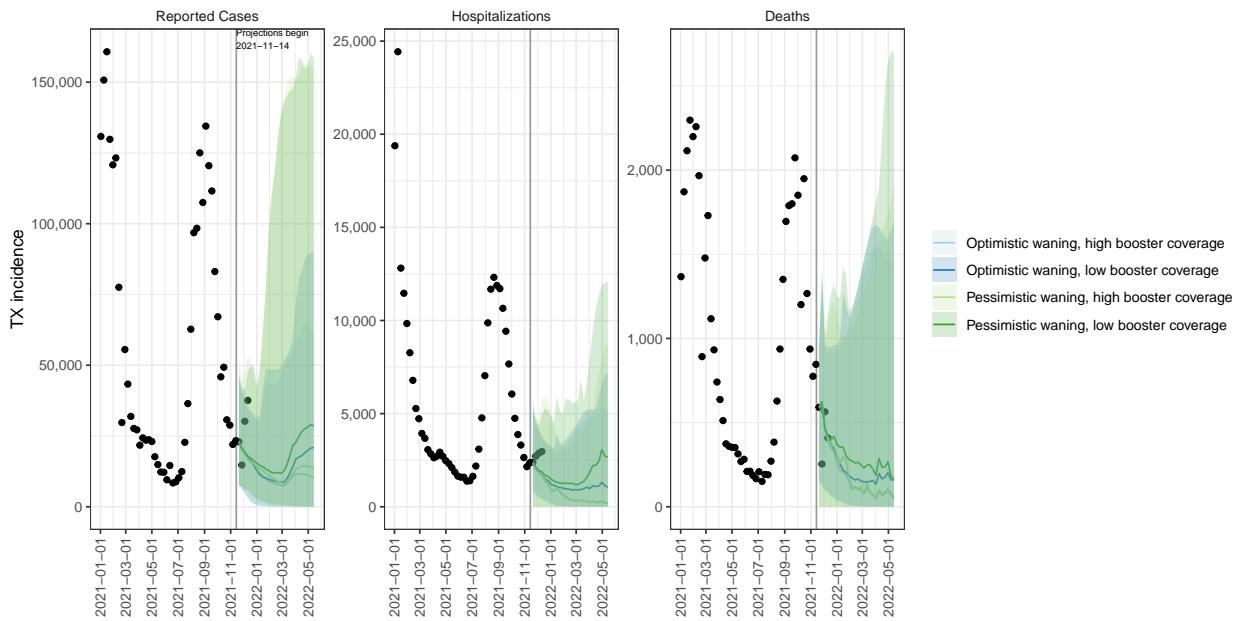
### SD ensemble projections & 95% projection intervals



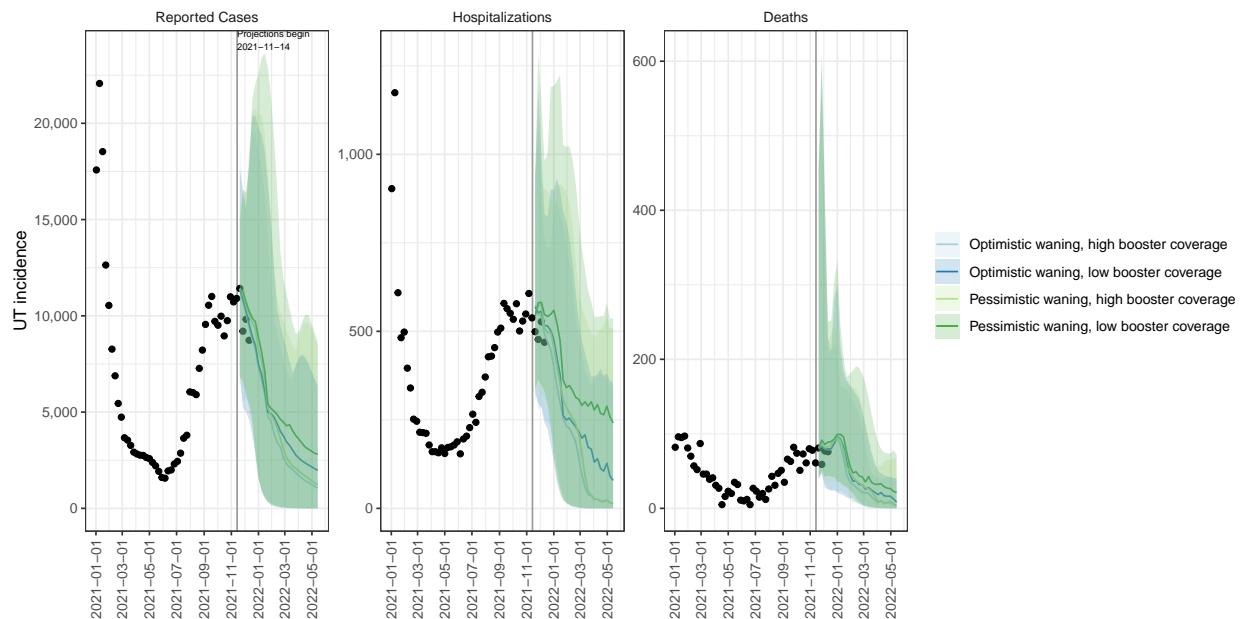
### TN ensemble projections & 95% projection intervals



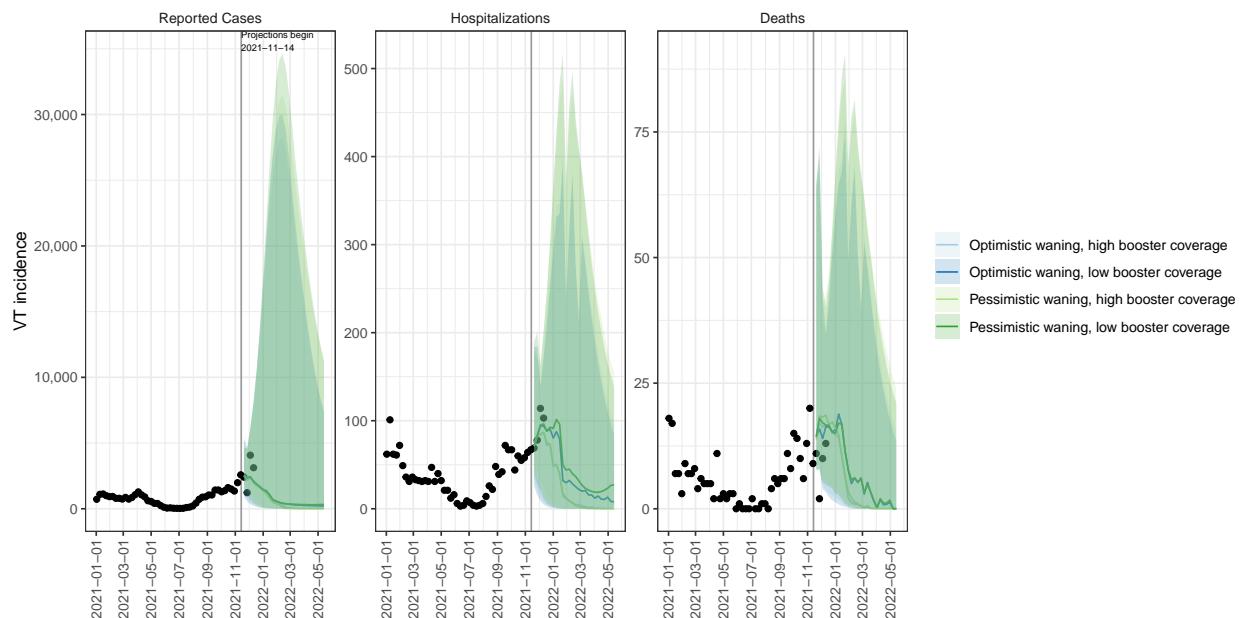
### TX ensemble projections & 95% projection intervals



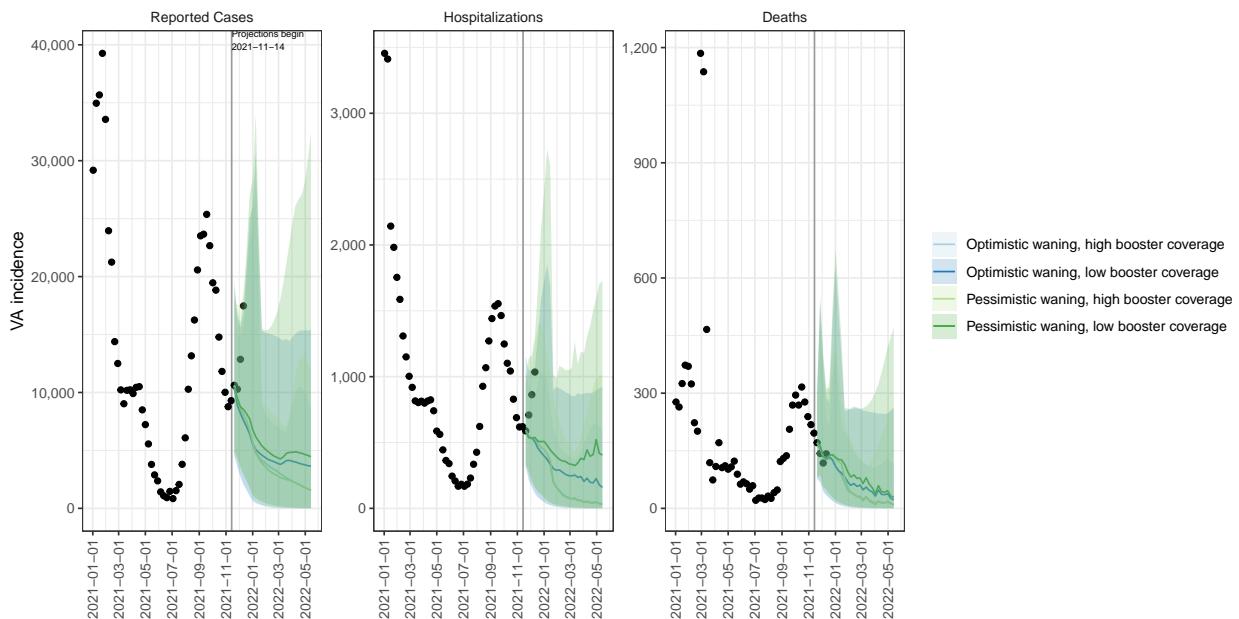
### UT ensemble projections & 95% projection intervals



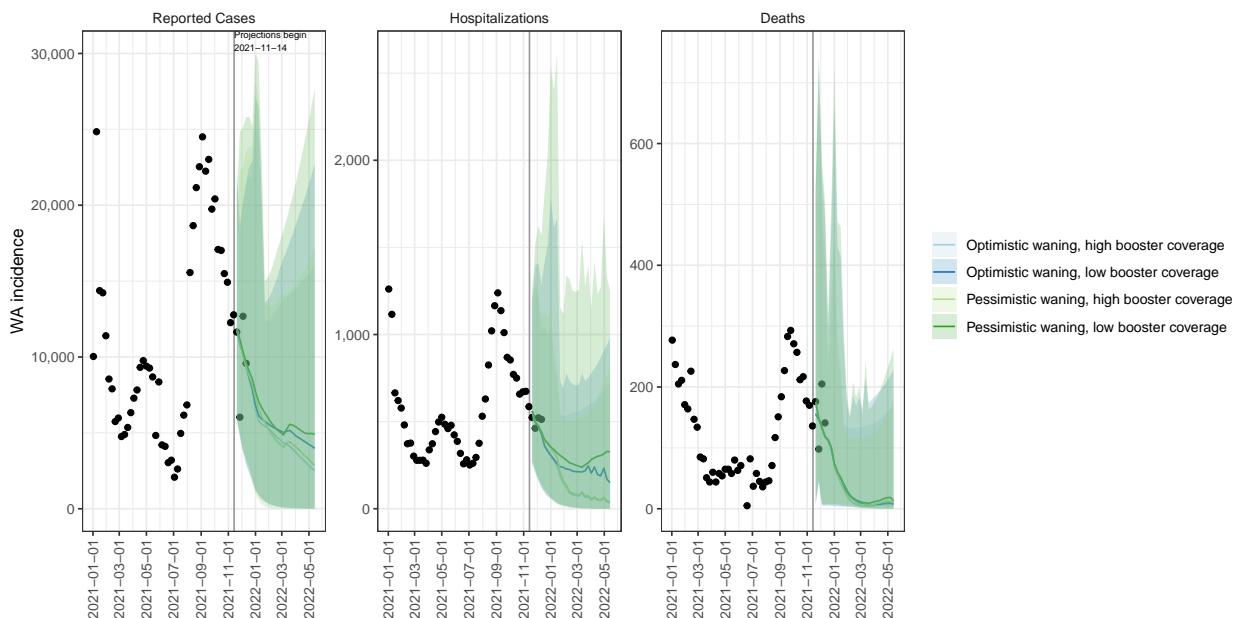
### VT ensemble projections & 95% projection intervals



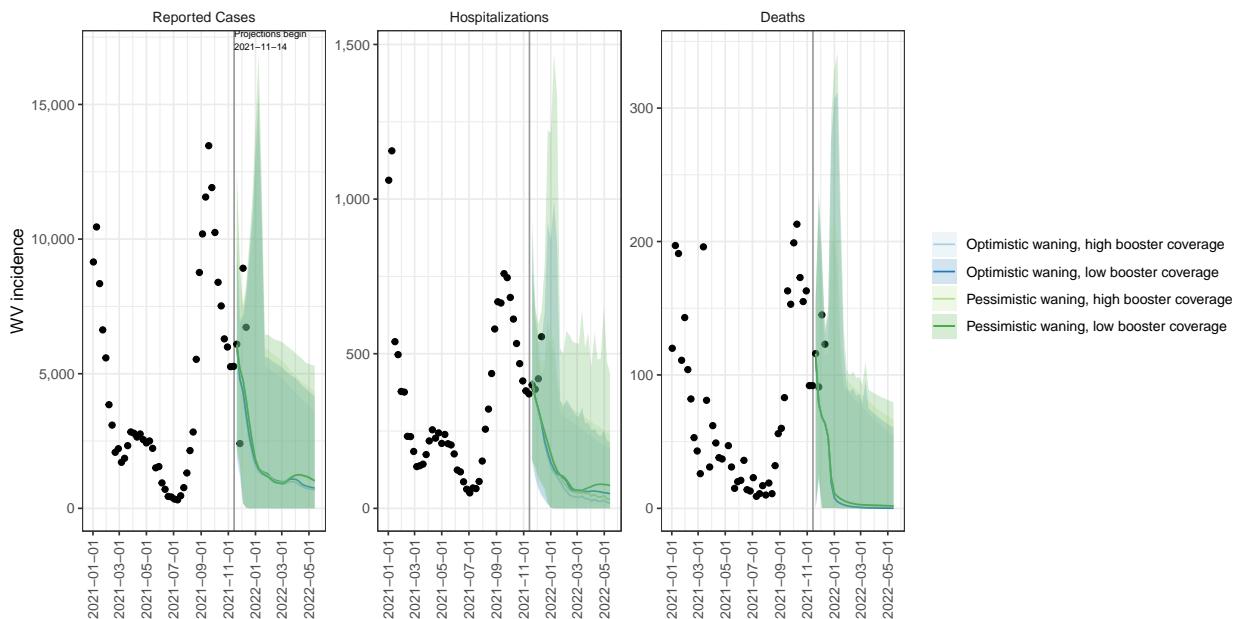
### VA ensemble projections & 95% projection intervals



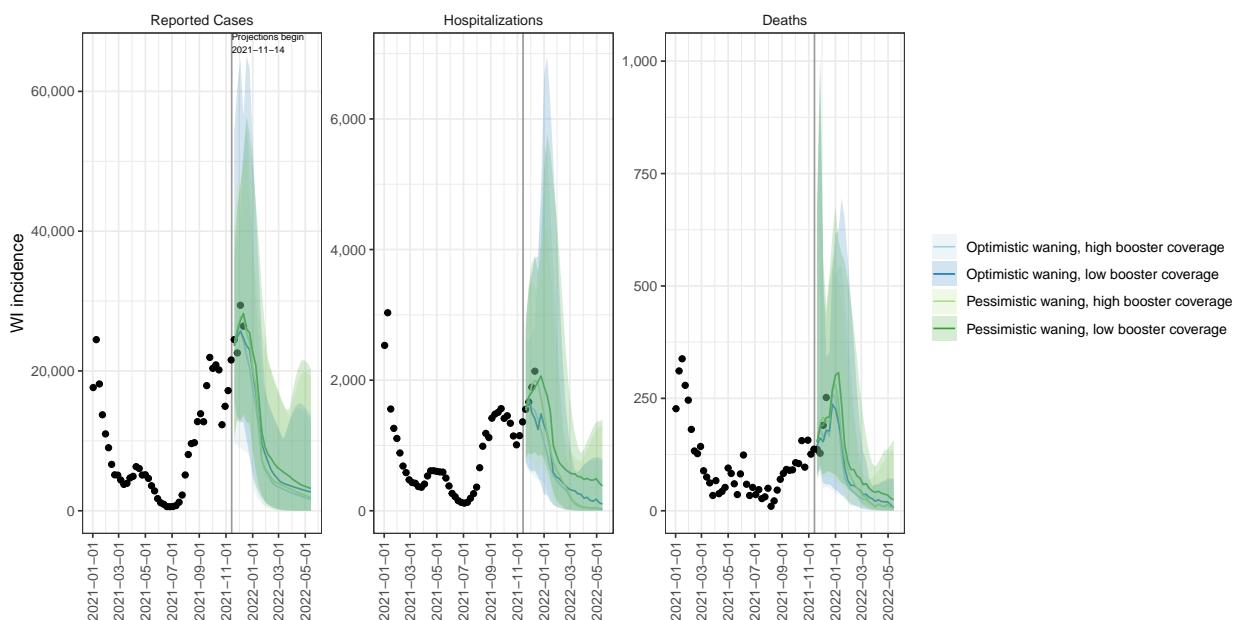
### WA ensemble projections & 95% projection intervals



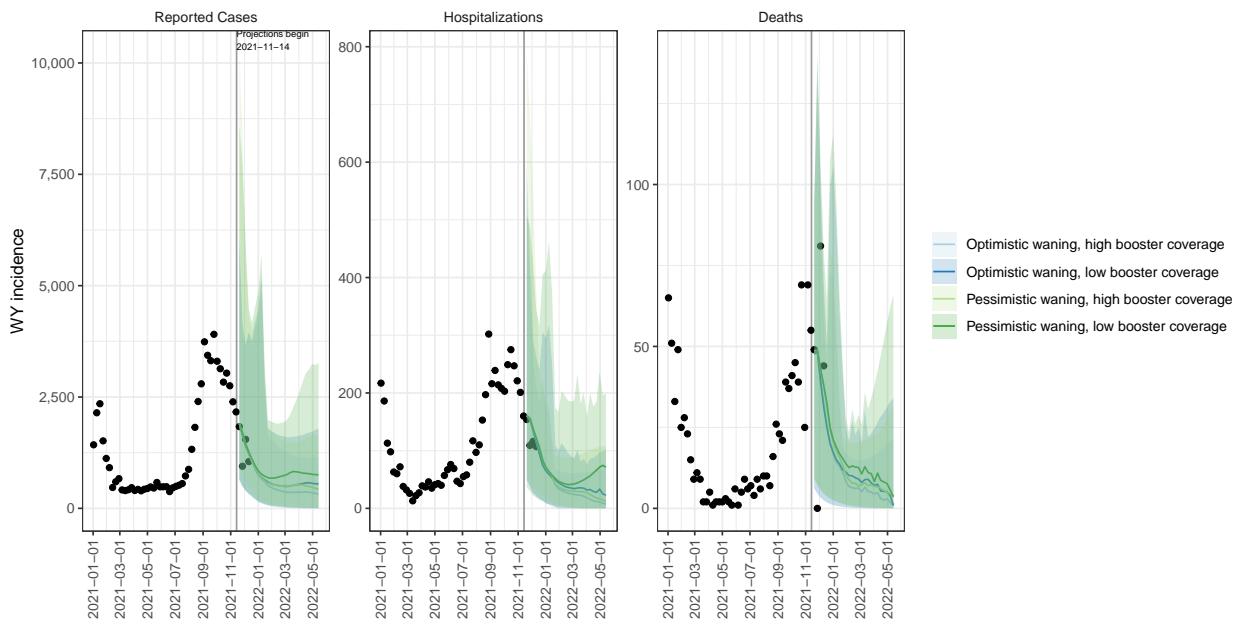
### WV ensemble projections & 95% projection intervals



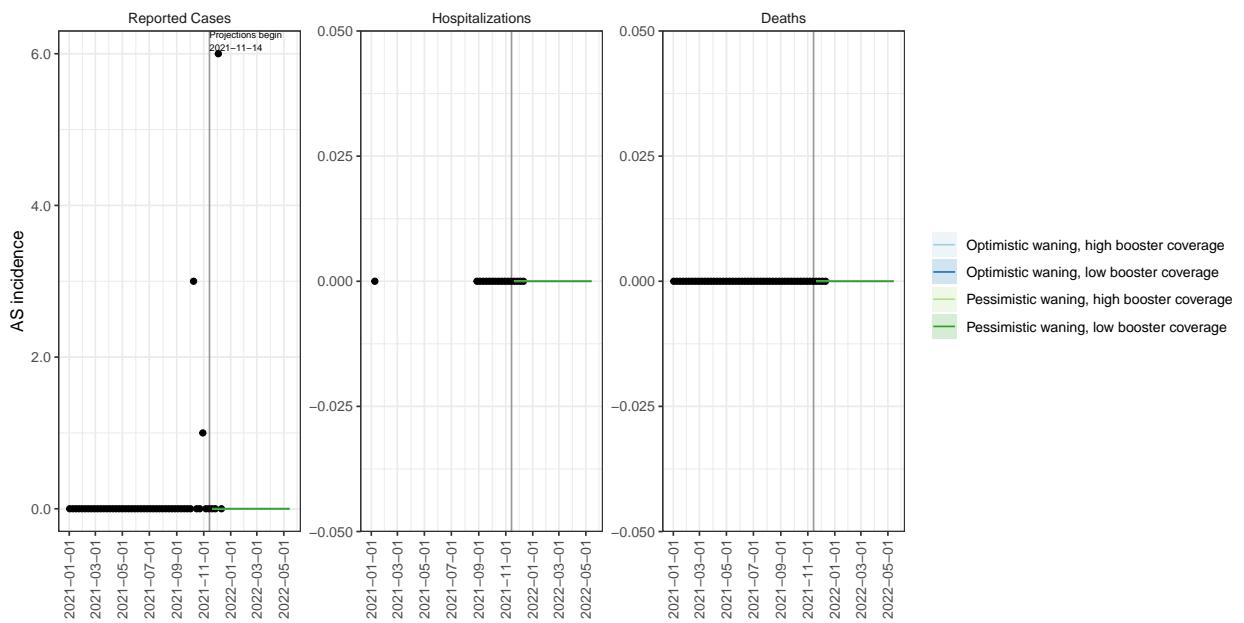
### WI ensemble projections & 95% projection intervals



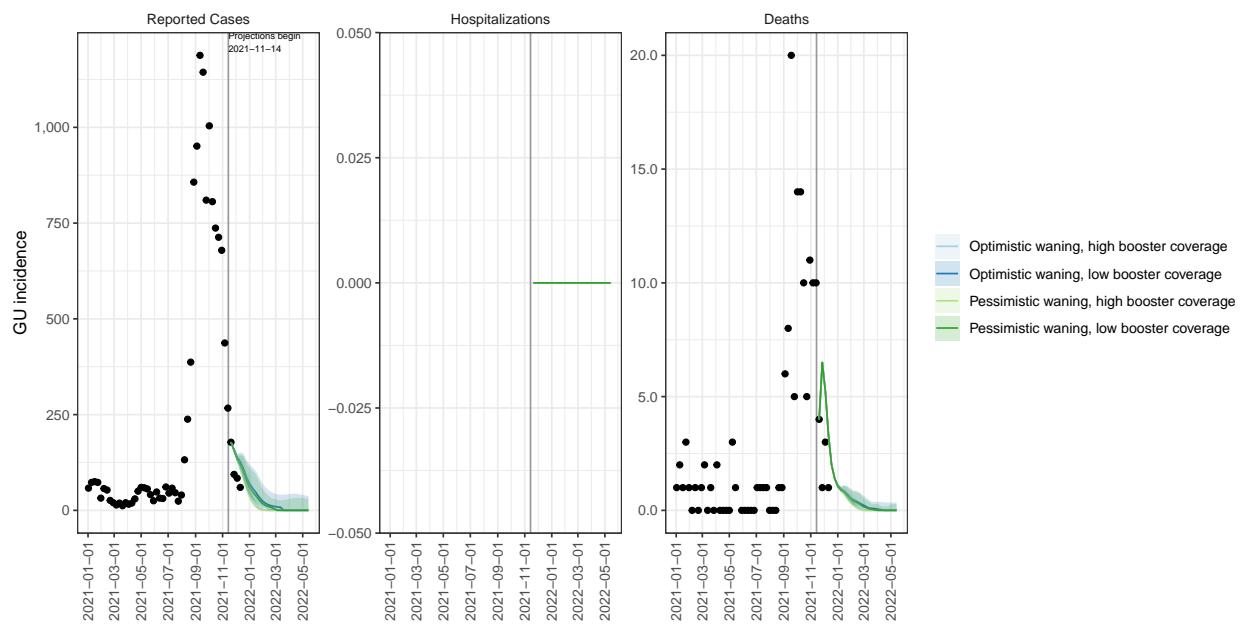
### WY ensemble projections & 95% projection intervals



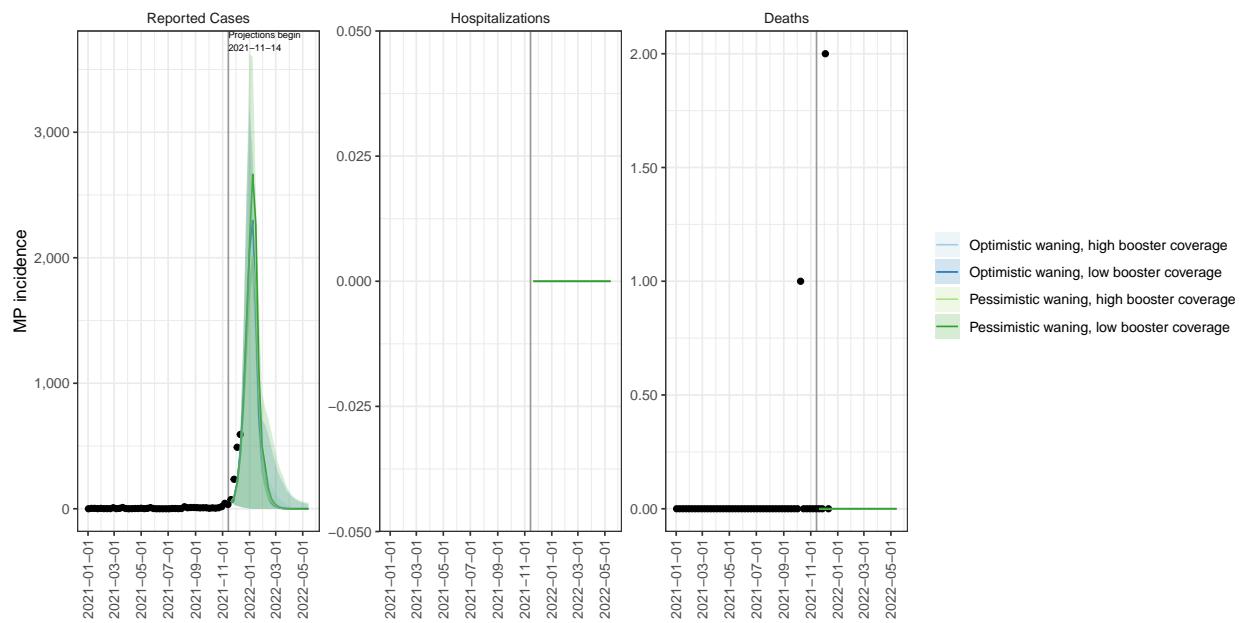
### AS ensemble projections & 95% projection intervals



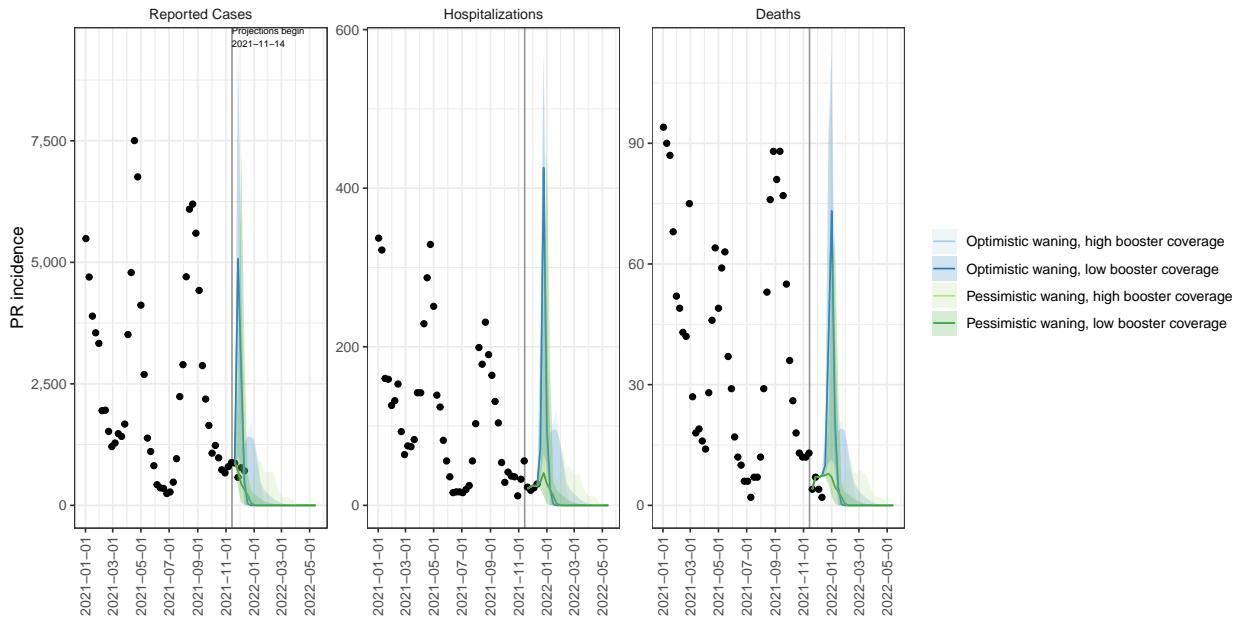
### GU ensemble projections & 95% projection intervals



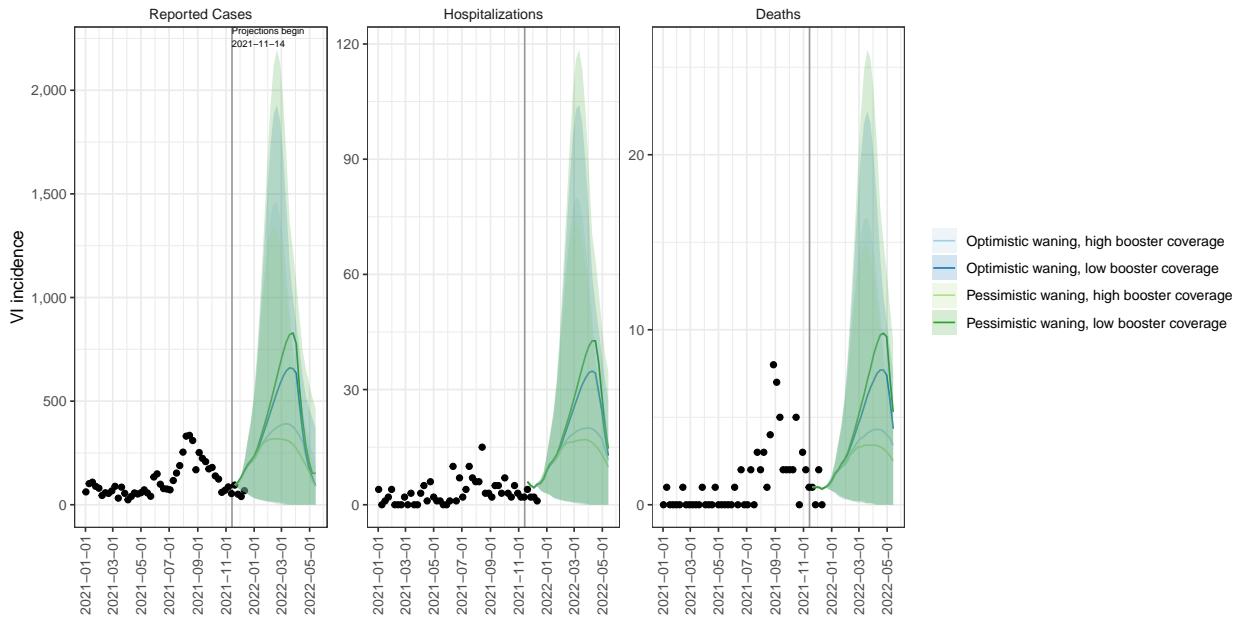
### MP ensemble projections & 95% projection intervals



### PR ensemble projections & 95% projection intervals



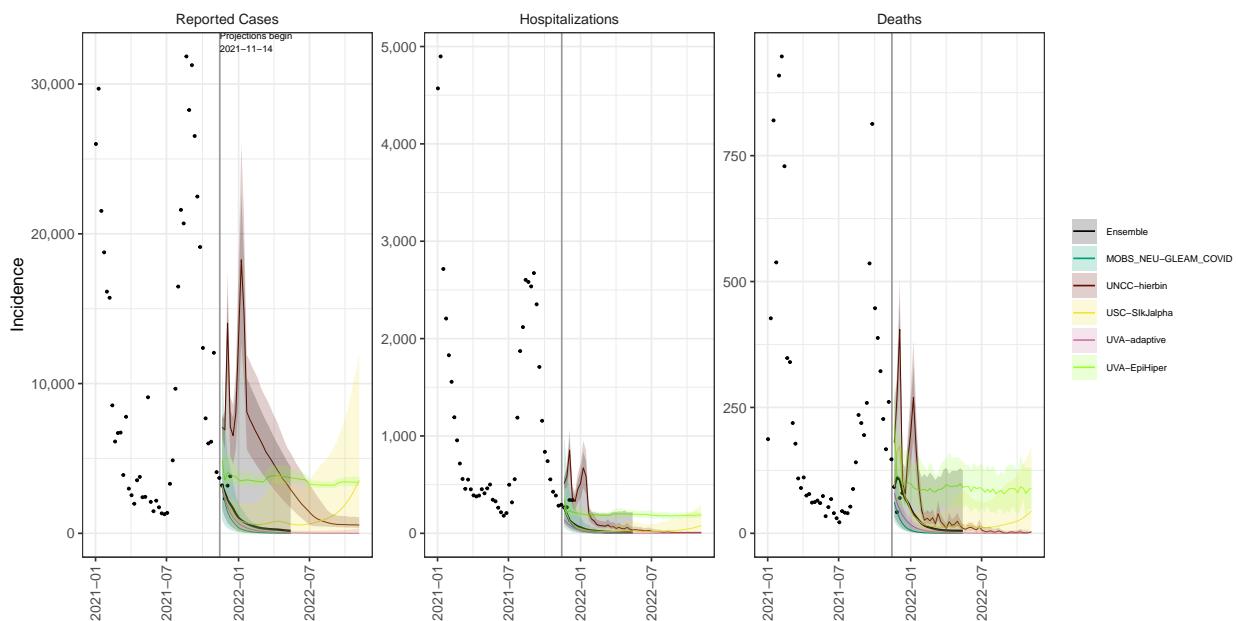
### VI ensemble projections & 95% projection intervals



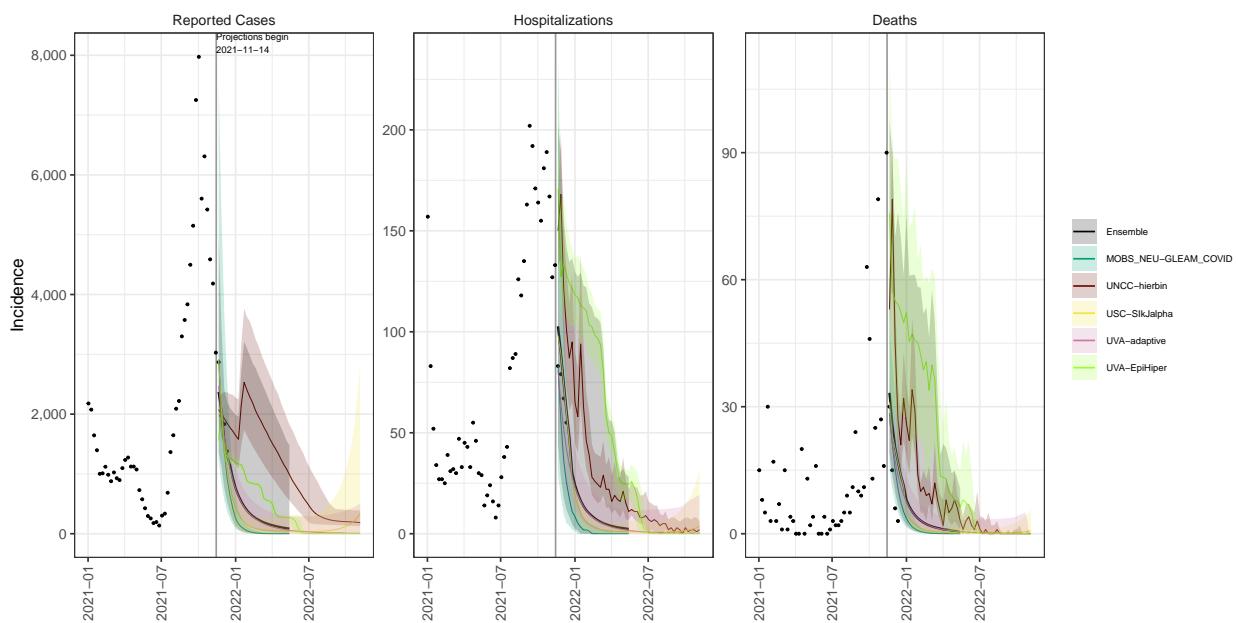
### State-level model variation

National model variation for optimistic waning, high booster coverage scenario.

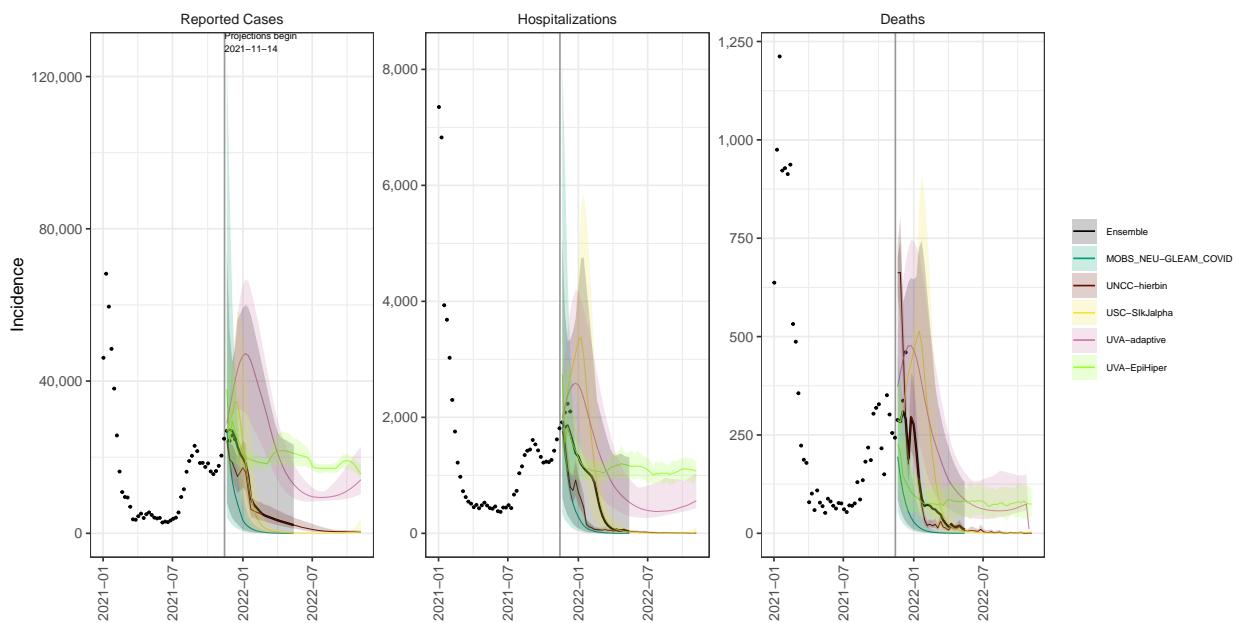
AL model variance & 95% projection intervals – Optimistic waning, high booster coverage



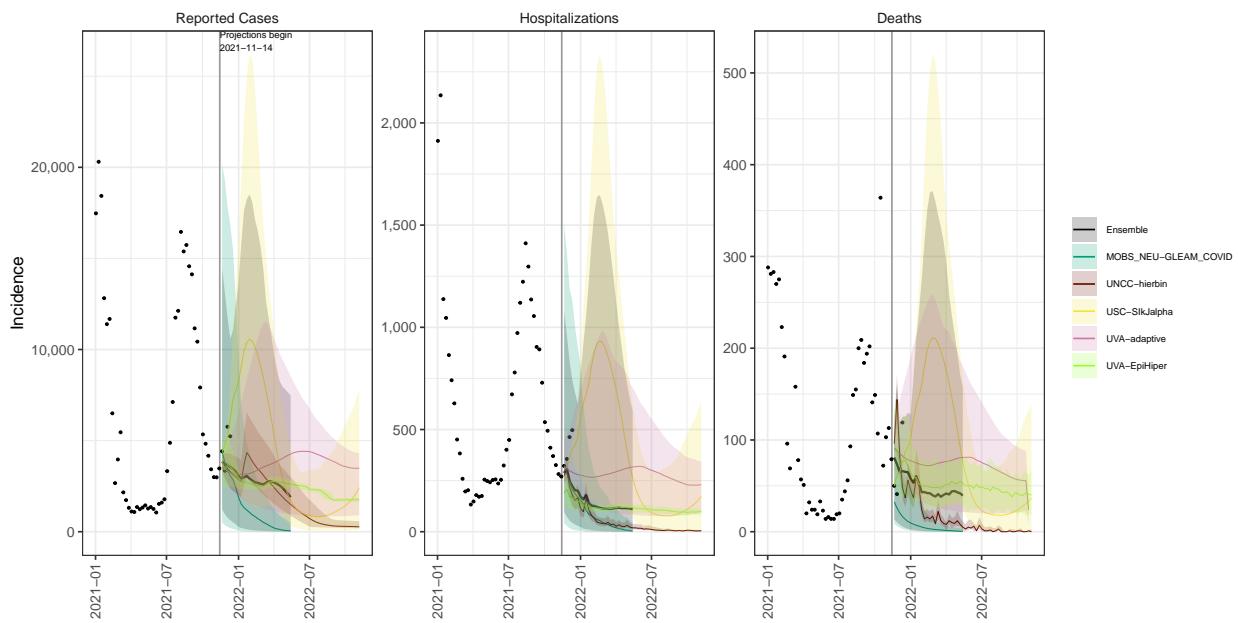
AK model variance & 95% projection intervals – Optimistic waning, high booster coverage



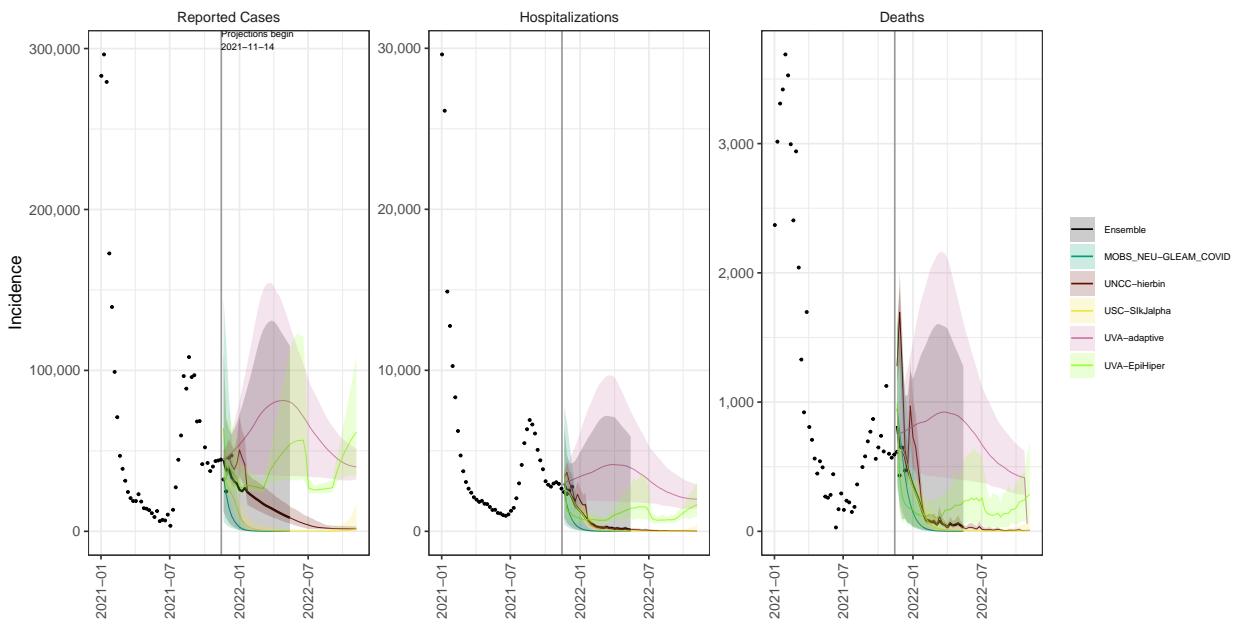
AZ model variance & 95% projection intervals – Optimistic waning, high booster coverage



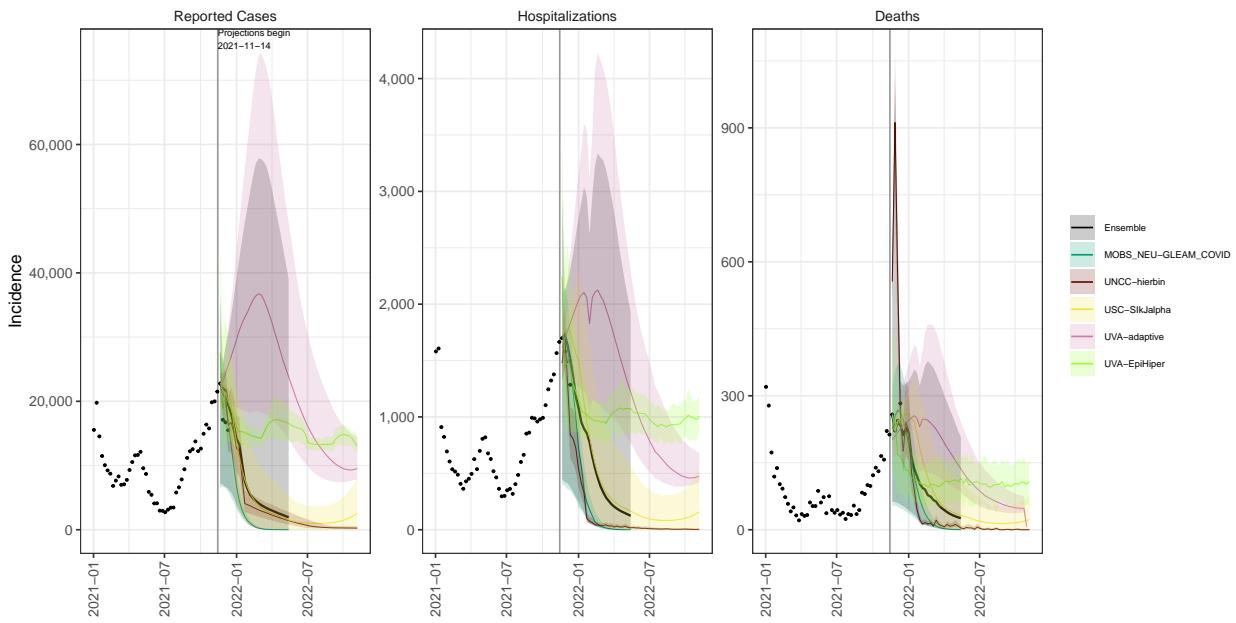
AR model variance & 95% projection intervals – Optimistic waning, high booster coverage



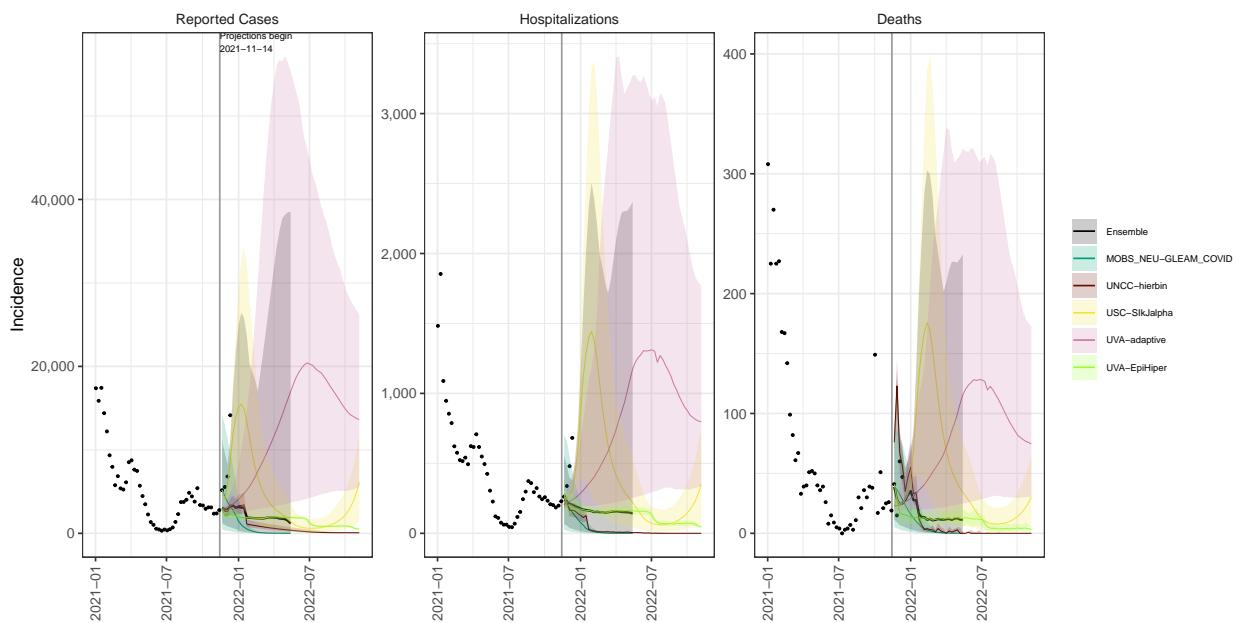
### CA model variance & 95% projection intervals – Optimistic waning, high booster coverage



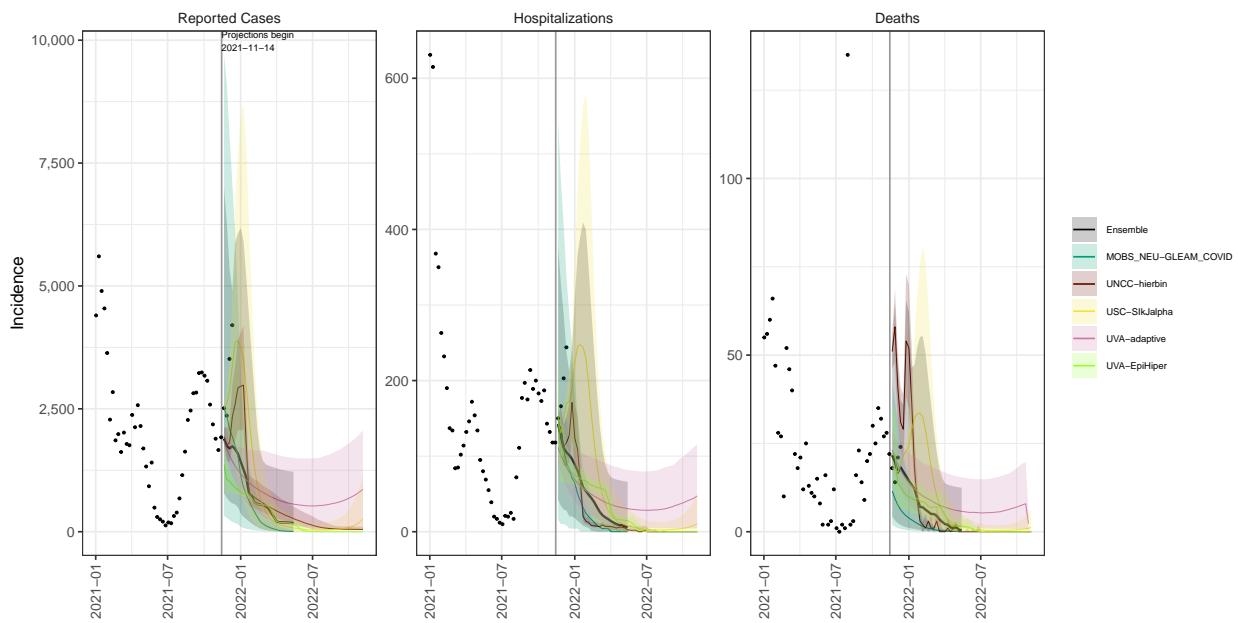
### CO model variance & 95% projection intervals – Optimistic waning, high booster coverage



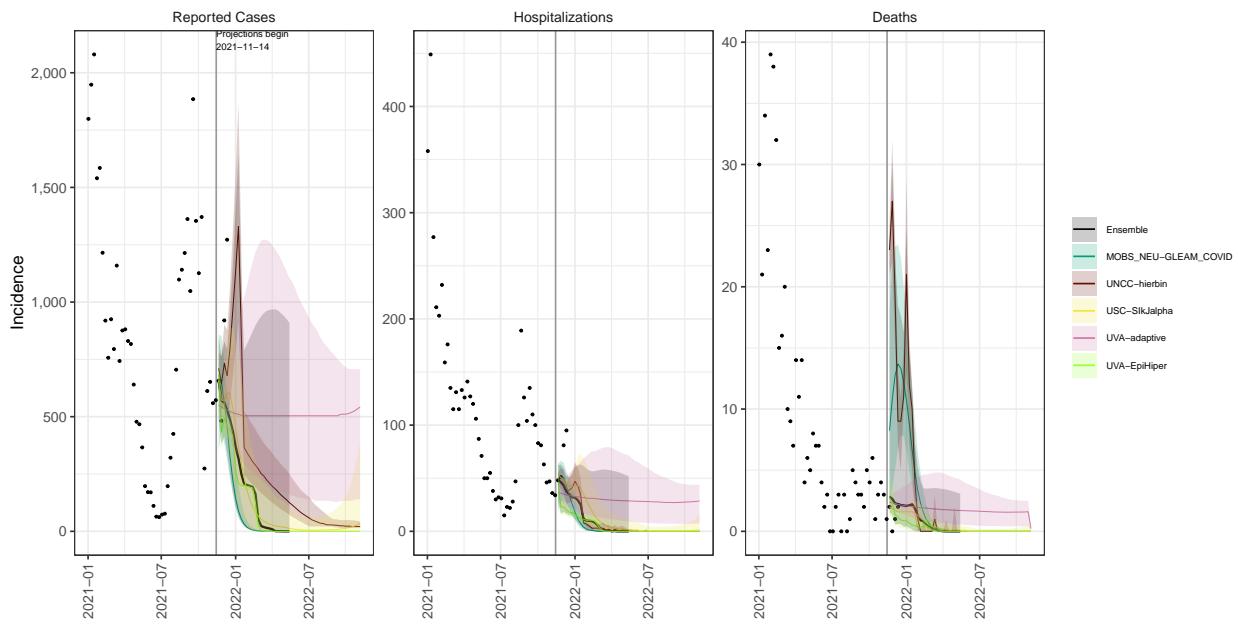
CT model variance & 95% projection intervals – Optimistic waning, high booster coverage



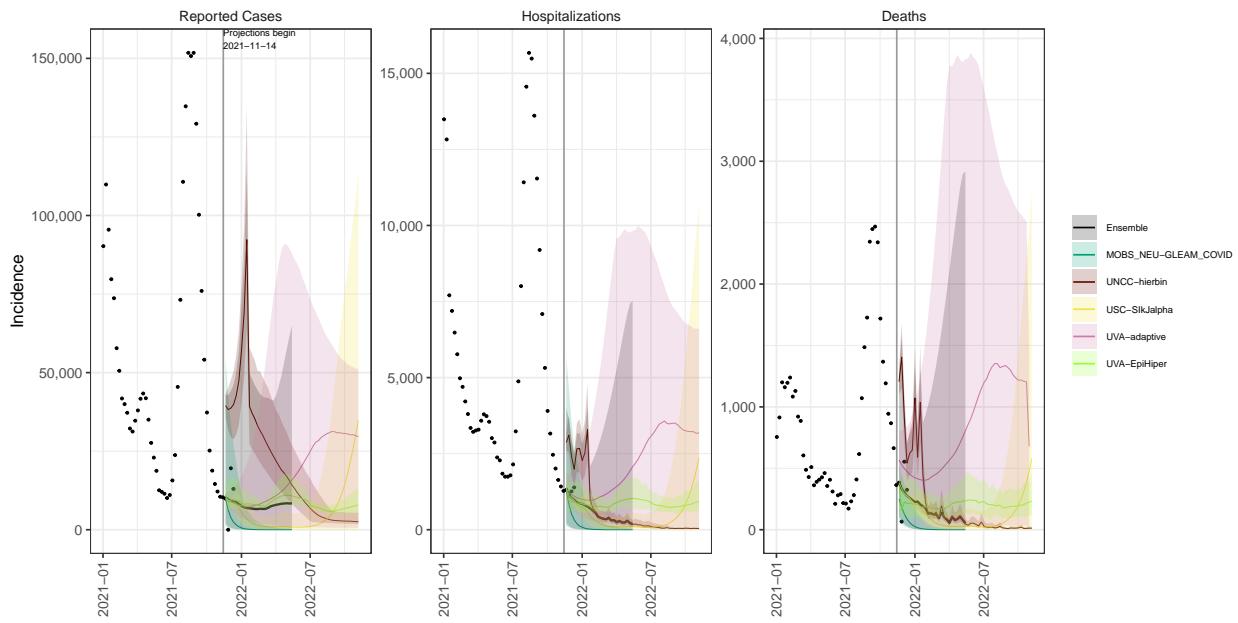
DE model variance & 95% projection intervals – Optimistic waning, high booster coverage



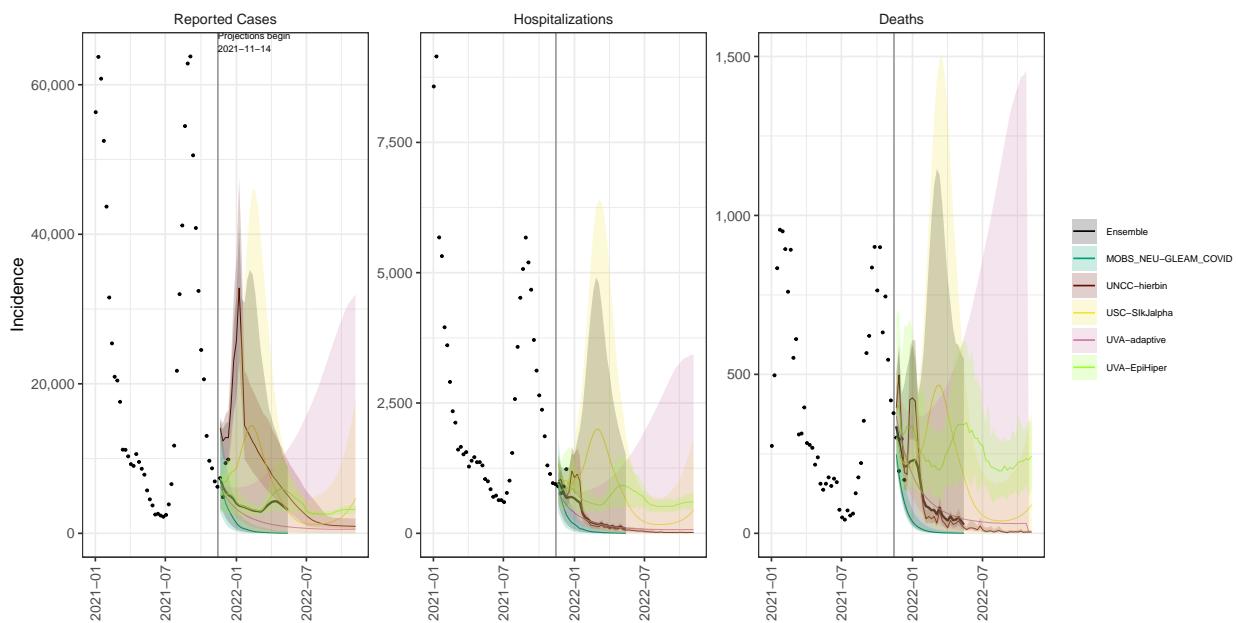
DC model variance & 95% projection intervals – Optimistic waning, high booster coverage



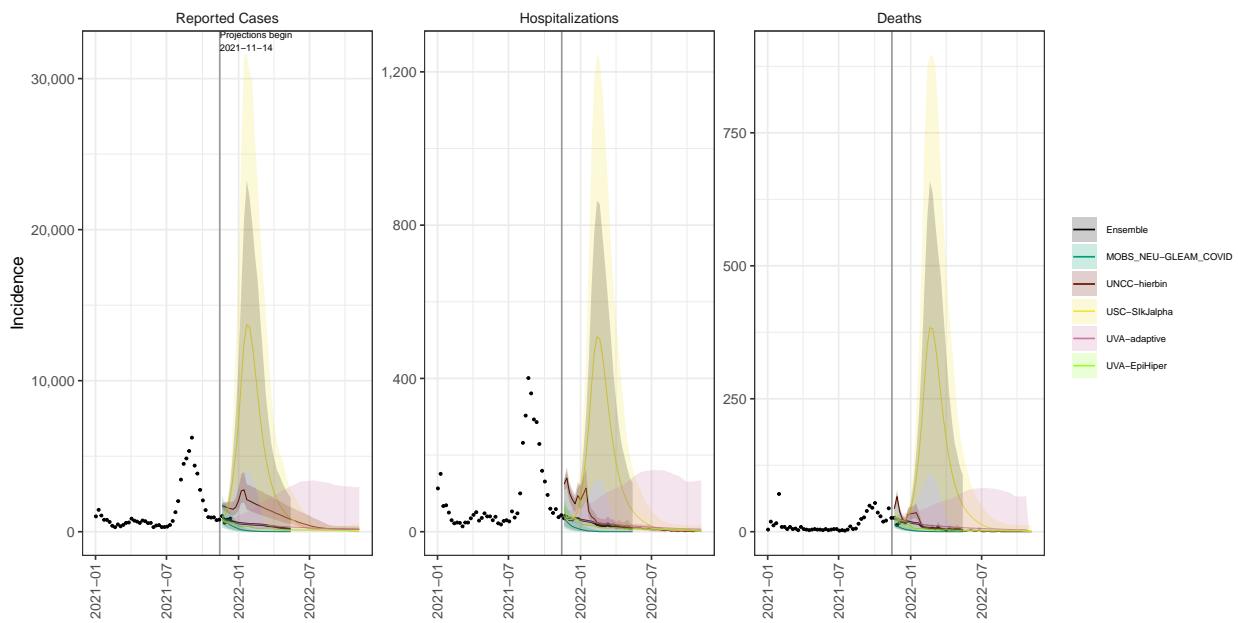
FL model variance & 95% projection intervals – Optimistic waning, high booster coverage



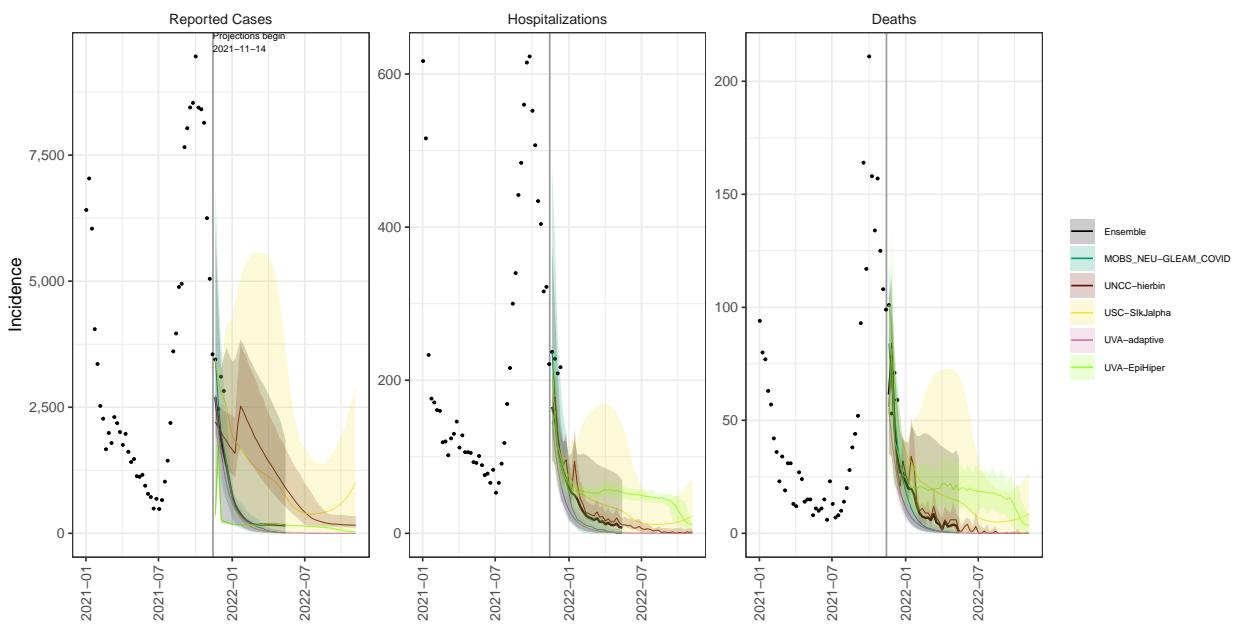
### GA model variance & 95% projection intervals – Optimistic waning, high booster coverage



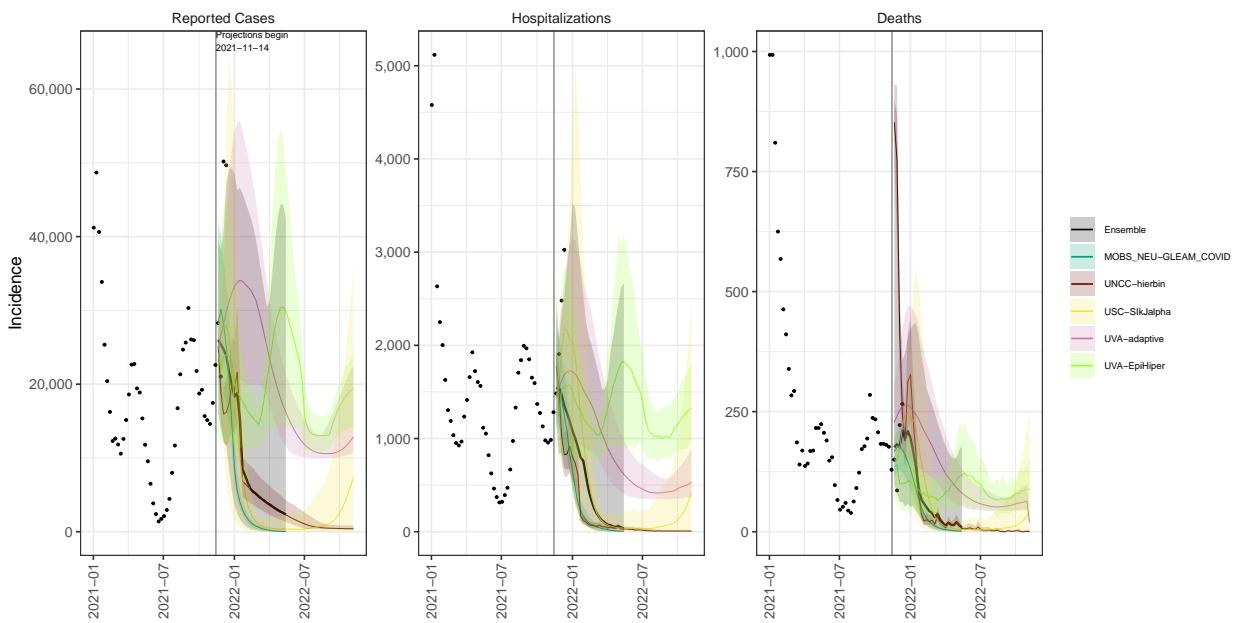
### HI model variance & 95% projection intervals – Optimistic waning, high booster coverage



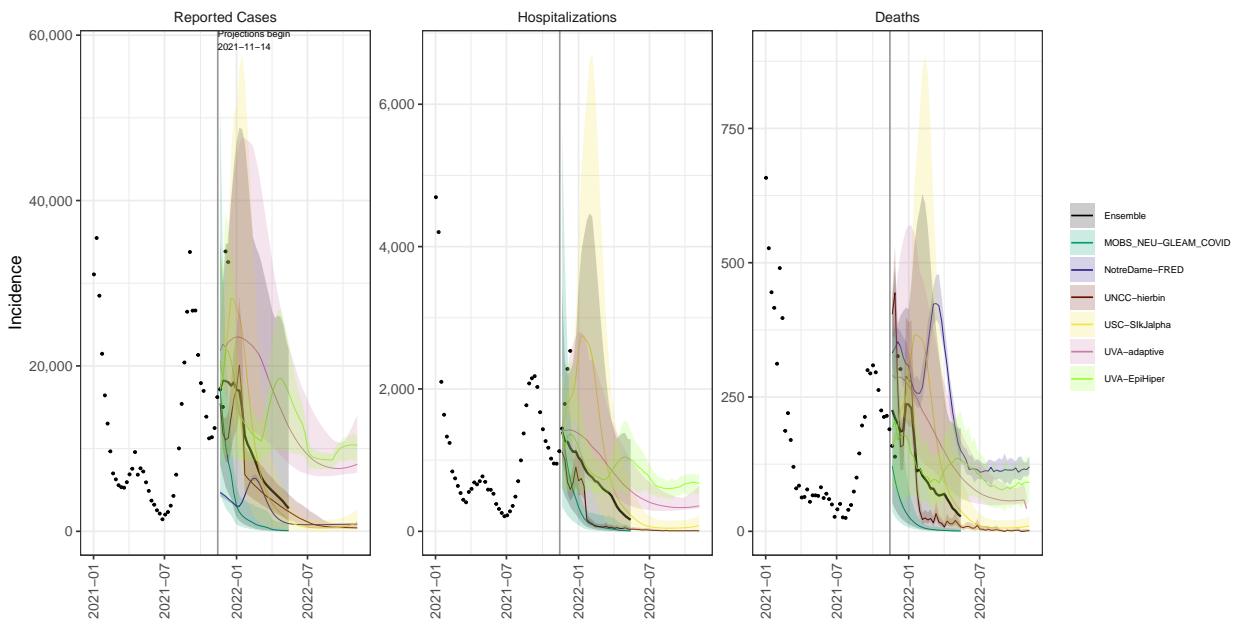
ID model variance & 95% projection intervals – Optimistic waning, high booster coverage



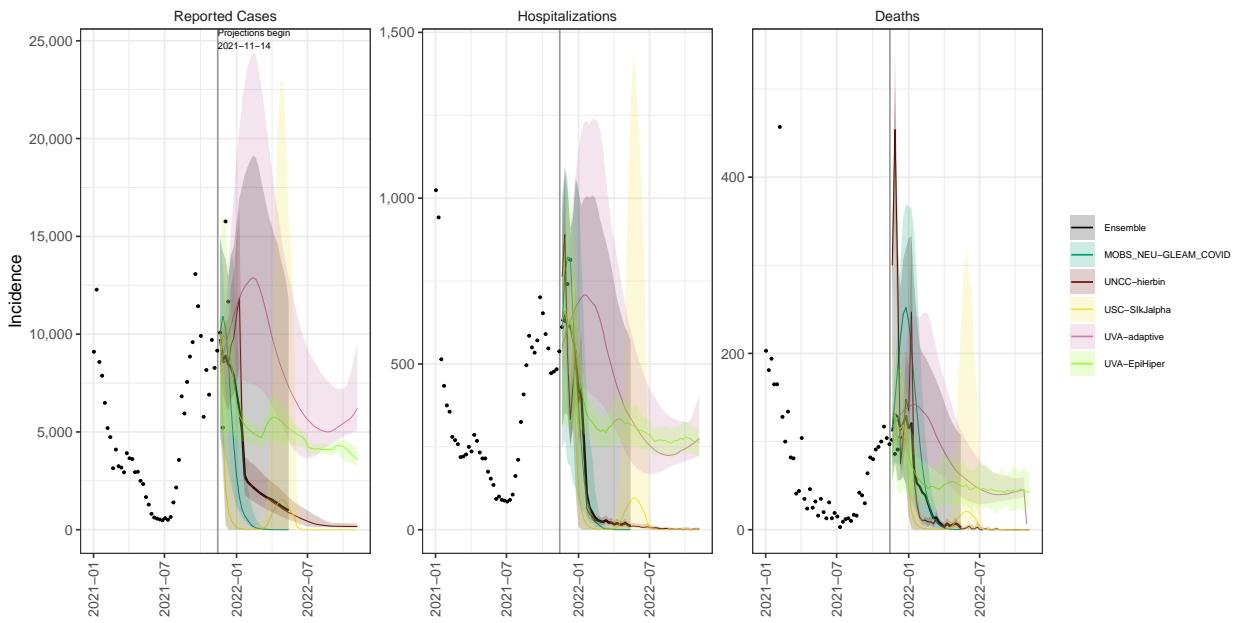
IL model variance & 95% projection intervals – Optimistic waning, high booster coverage



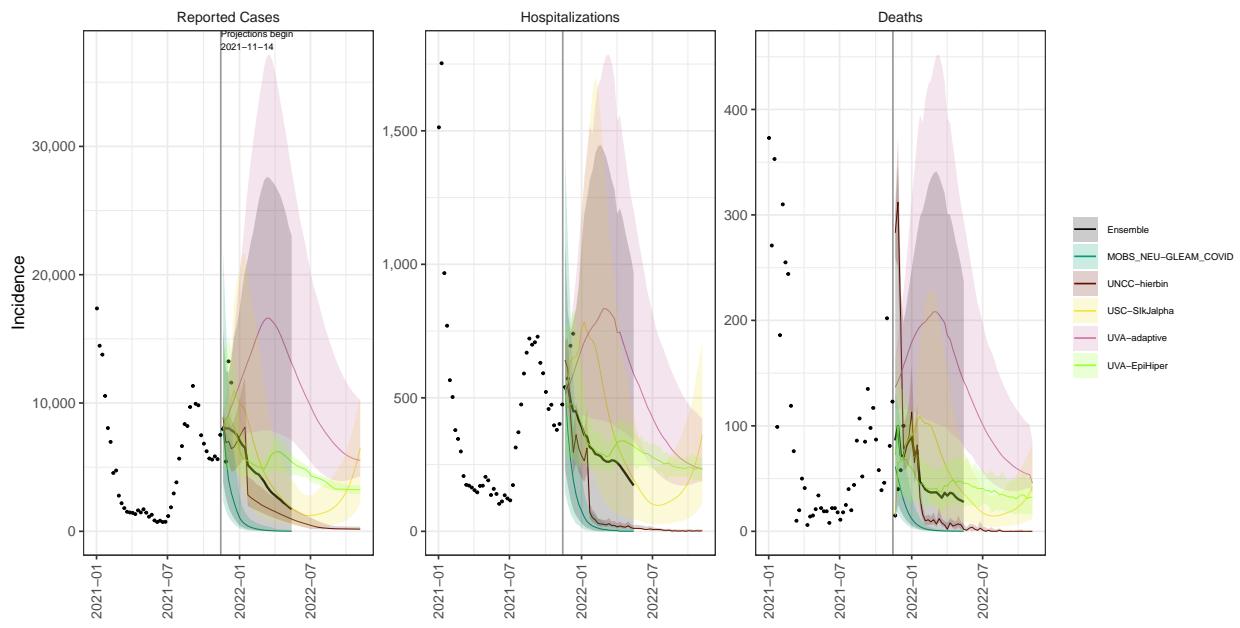
IN model variance & 95% projection intervals – Optimistic waning, high booster coverage



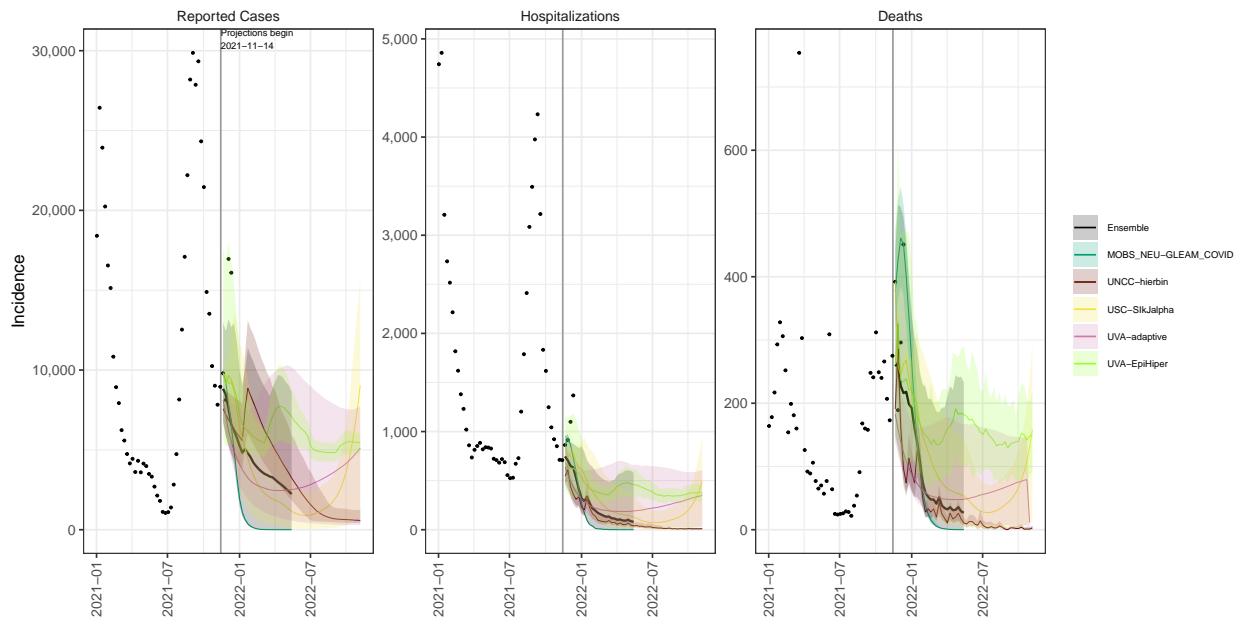
IA model variance & 95% projection intervals – Optimistic waning, high booster coverage



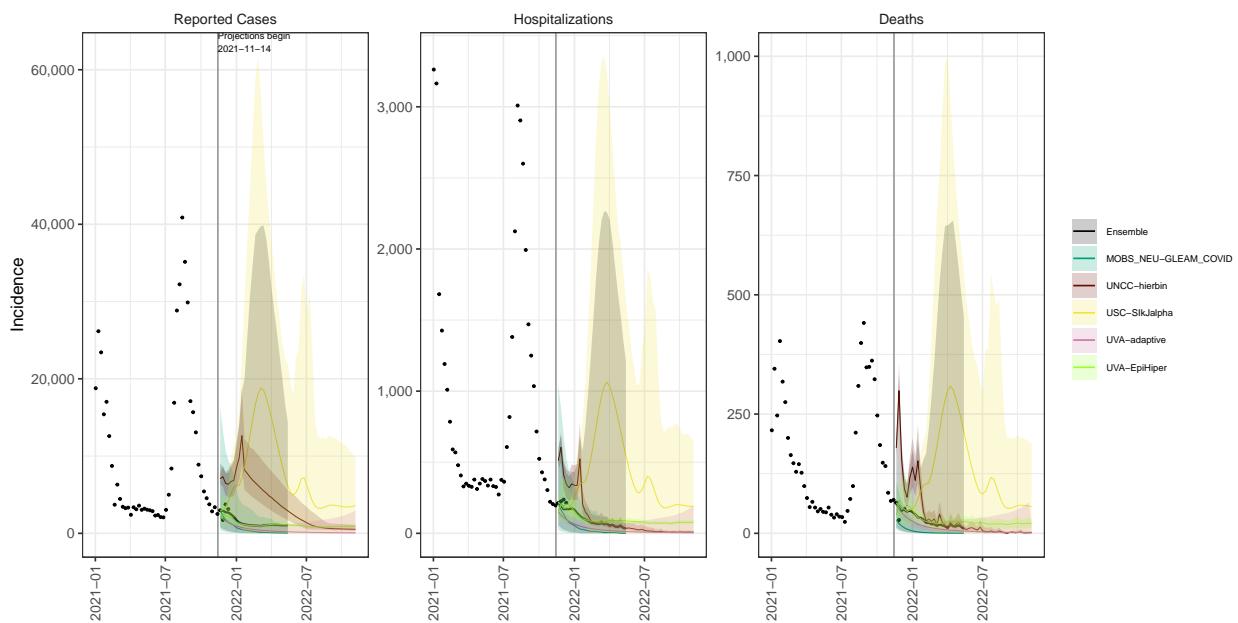
KS model variance & 95% projection intervals – Optimistic waning, high booster coverage



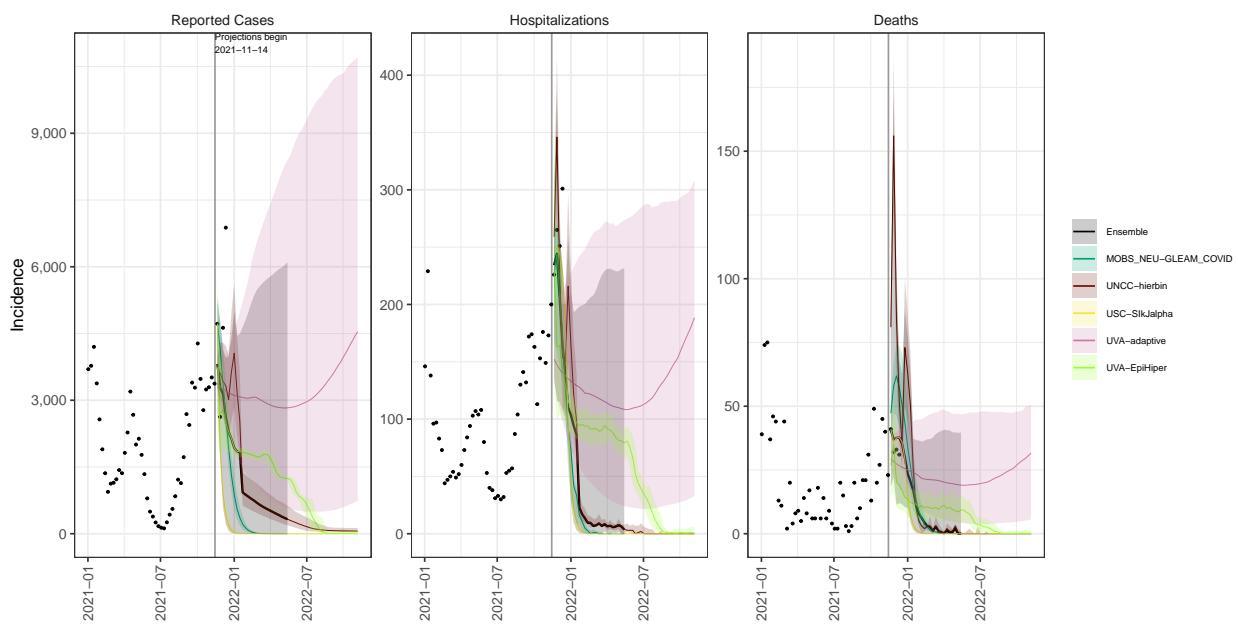
KY model variance & 95% projection intervals – Optimistic waning, high booster coverage



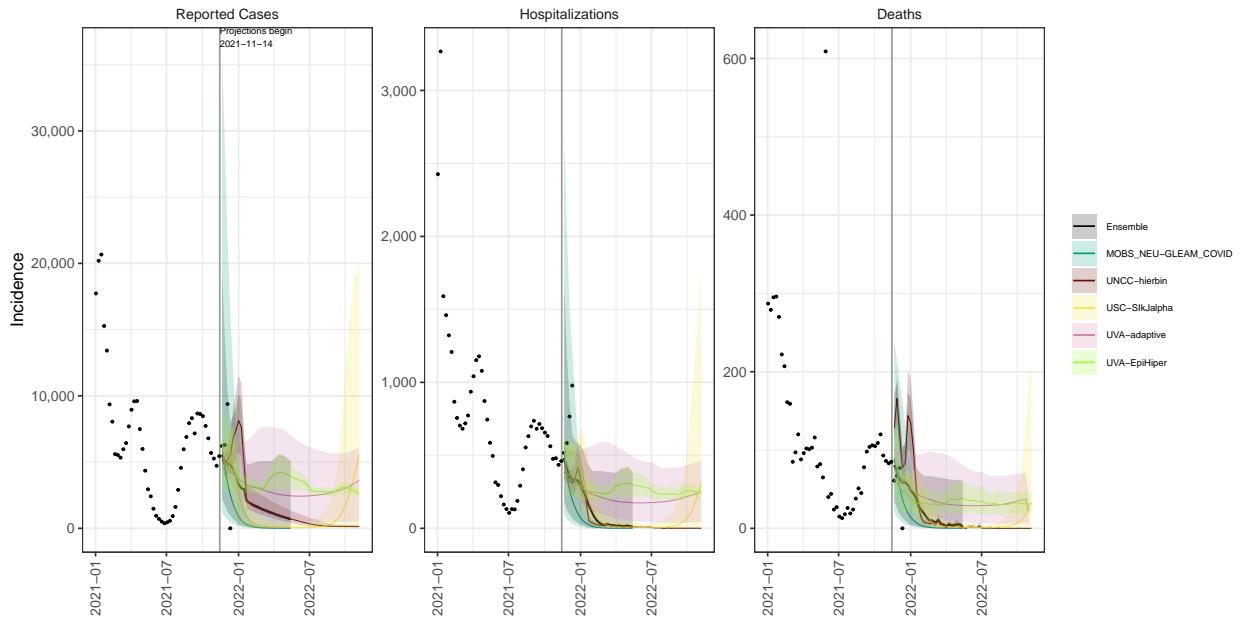
LA model variance & 95% projection intervals – Optimistic waning, high booster coverage



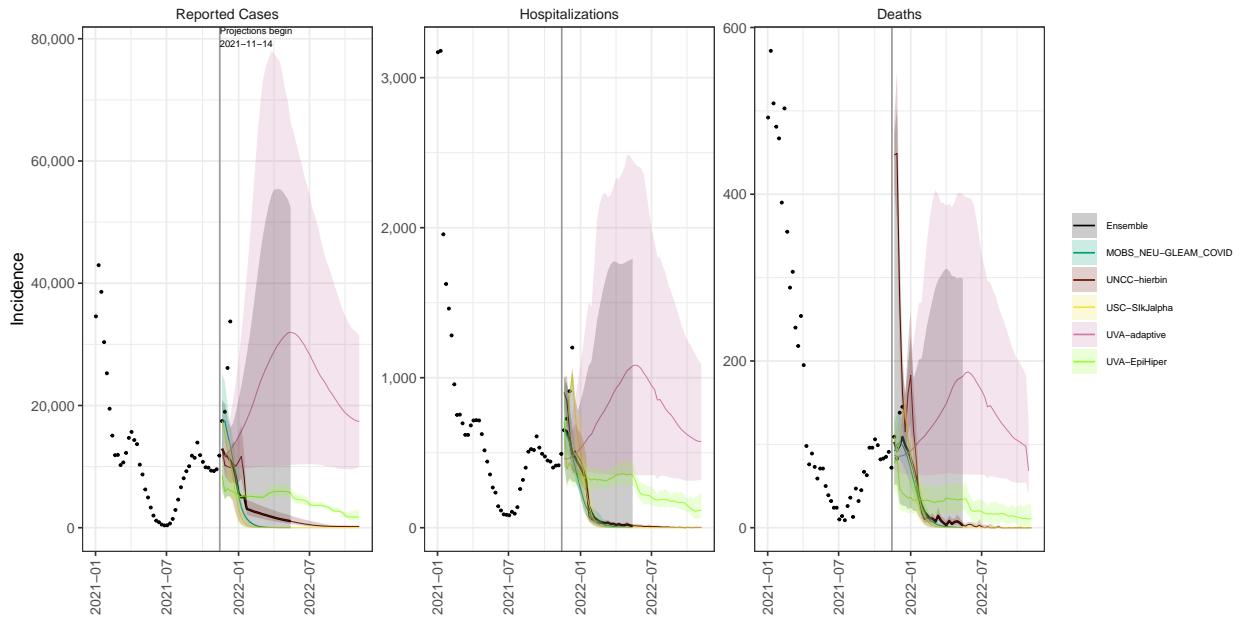
ME model variance & 95% projection intervals – Optimistic waning, high booster coverage



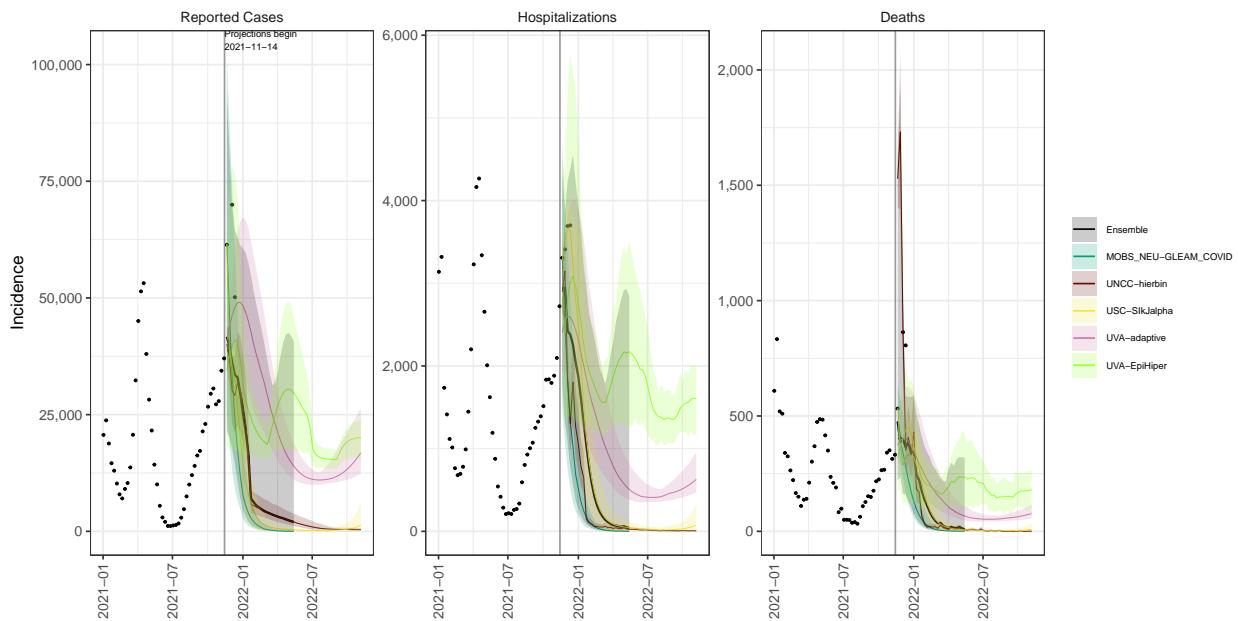
### MD model variance & 95% projection intervals – Optimistic waning, high booster coverage



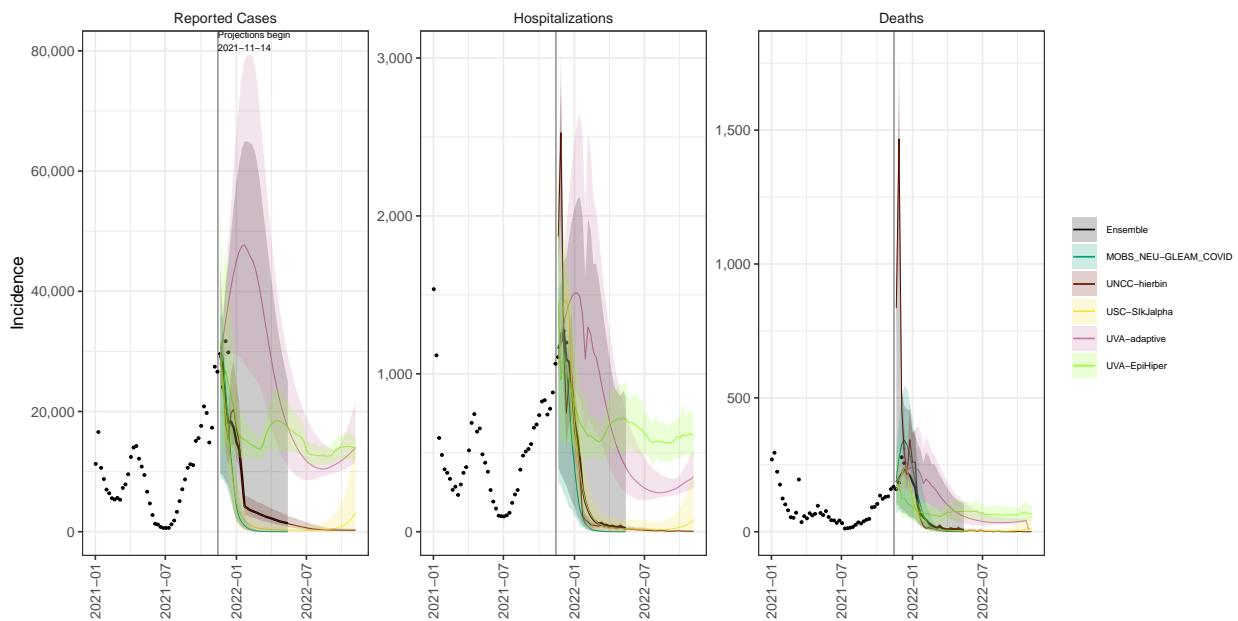
### MA model variance & 95% projection intervals – Optimistic waning, high booster coverage



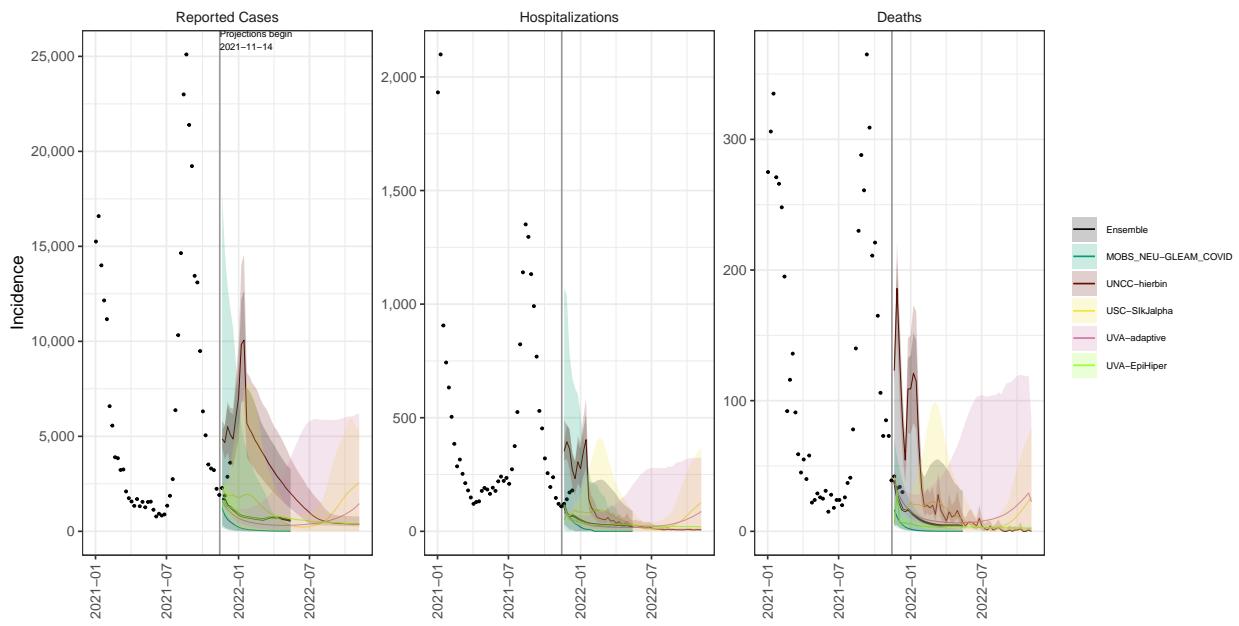
### MI model variance & 95% projection intervals – Optimistic waning, high booster coverage



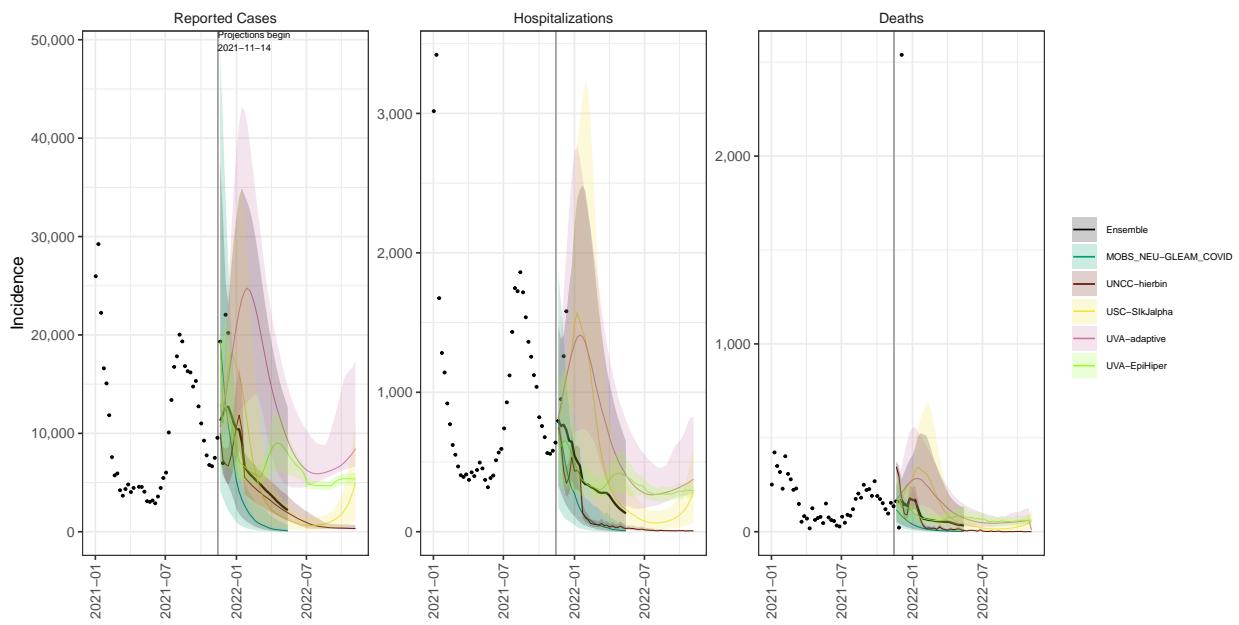
### MN model variance & 95% projection intervals – Optimistic waning, high booster coverage



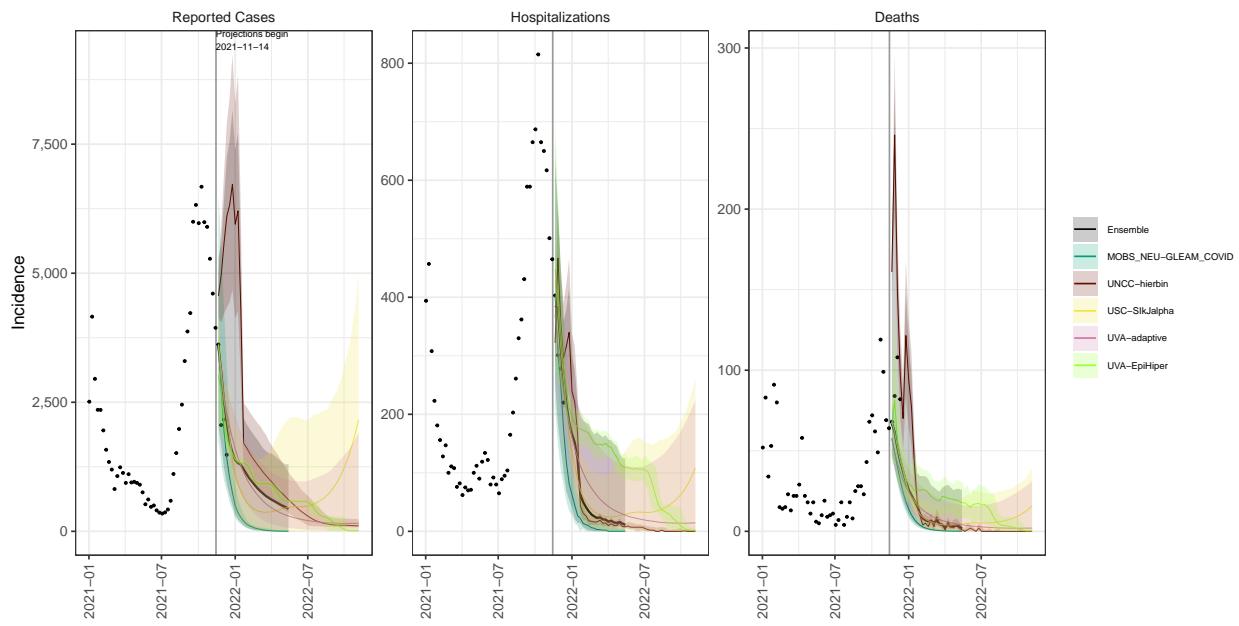
MS model variance & 95% projection intervals – Optimistic waning, high booster coverage



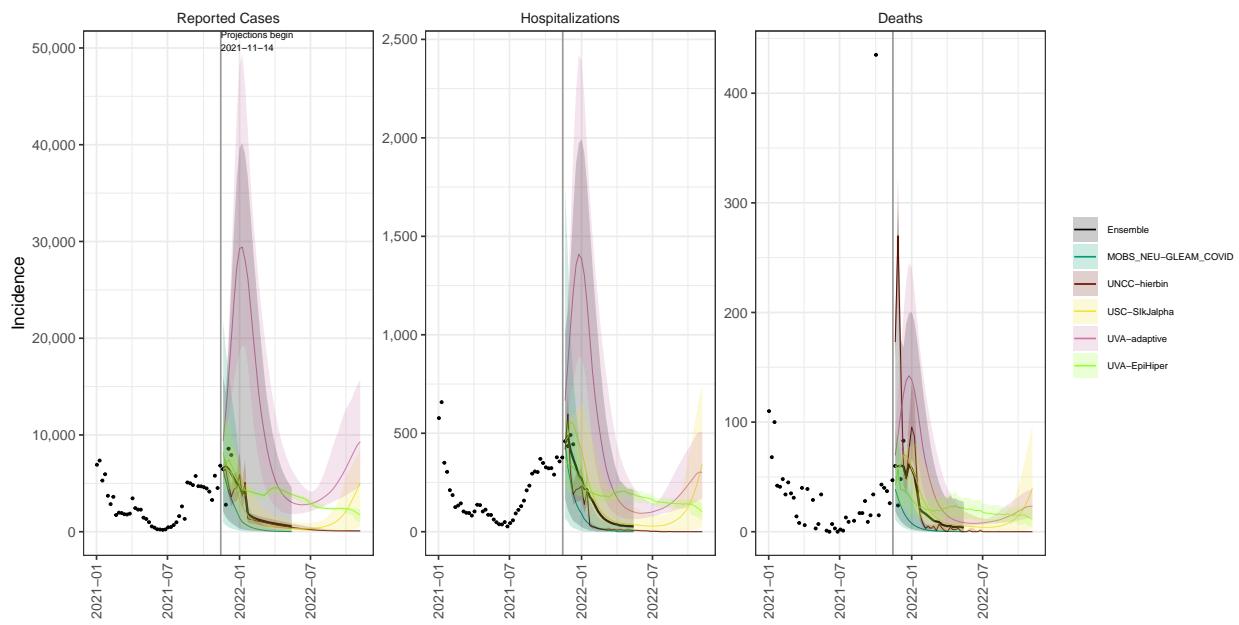
MO model variance & 95% projection intervals – Optimistic waning, high booster coverage



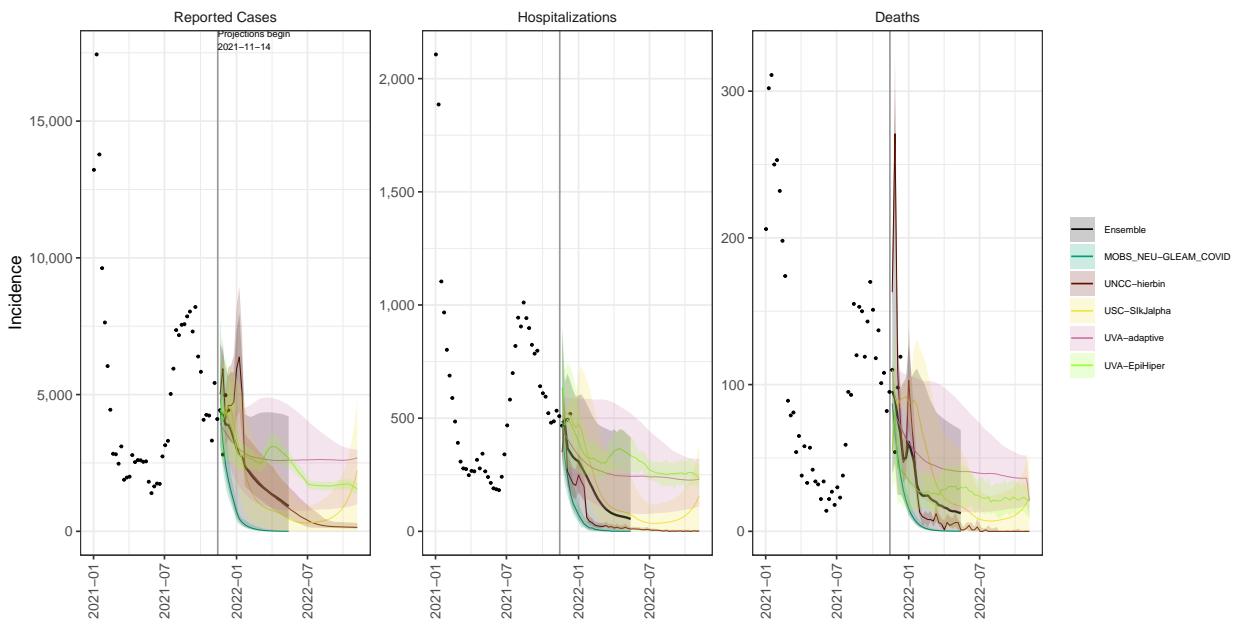
MT model variance & 95% projection intervals – Optimistic waning, high booster coverage



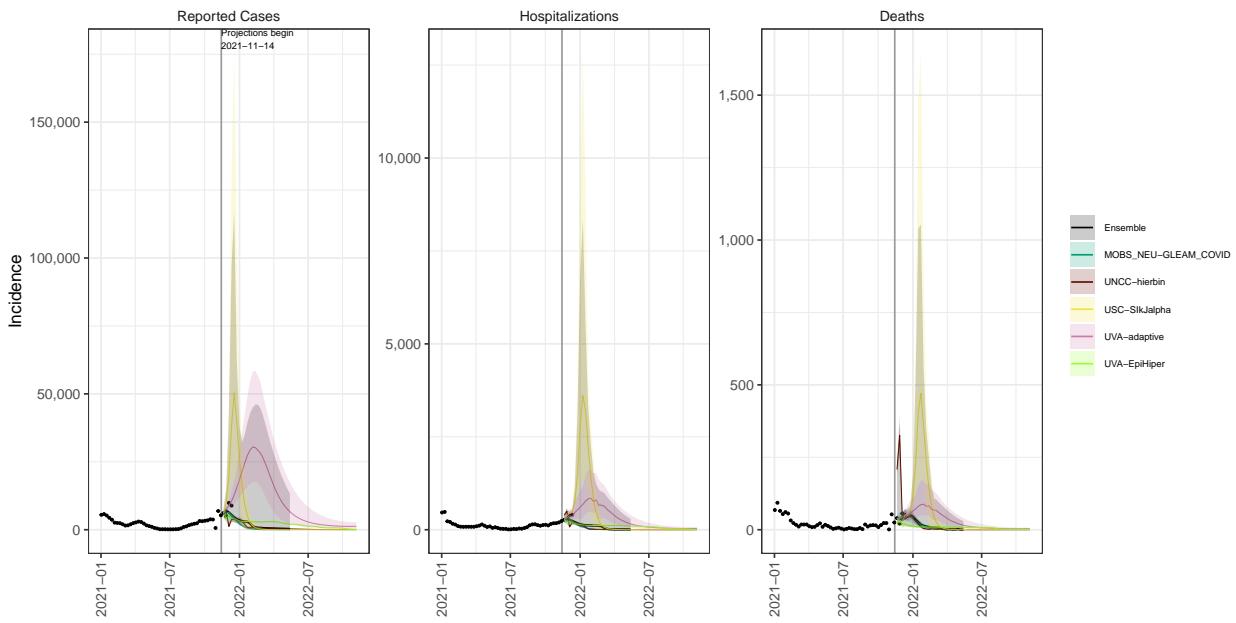
NE model variance & 95% projection intervals – Optimistic waning, high booster coverage



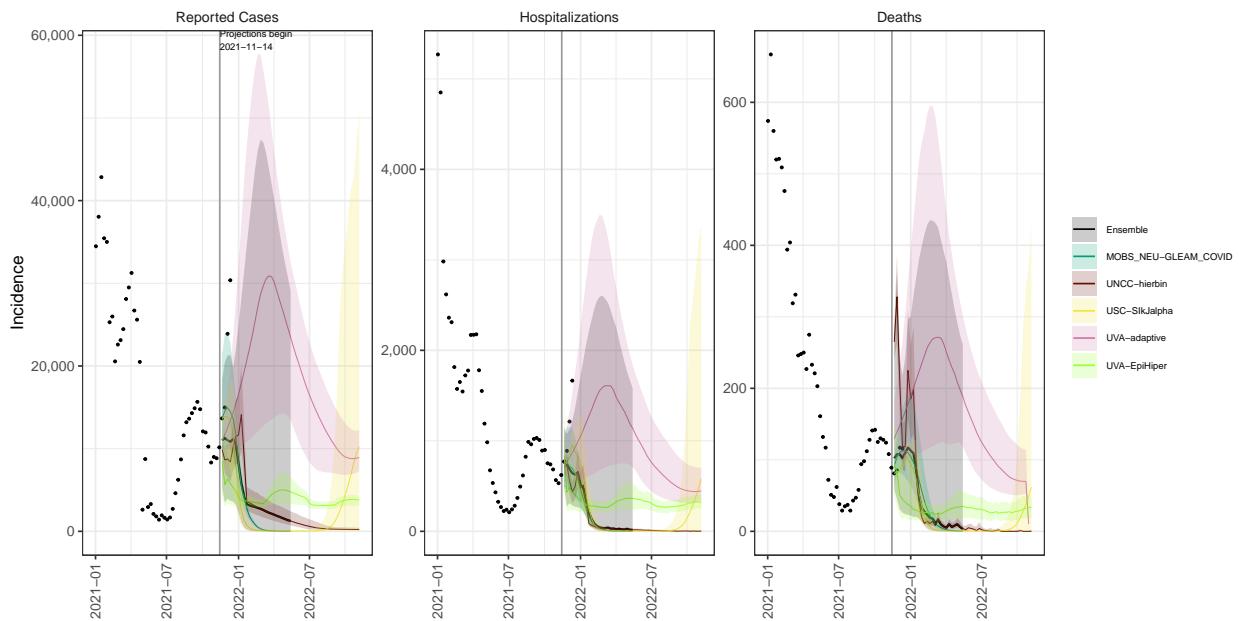
### NV model variance & 95% projection intervals – Optimistic waning, high booster coverage



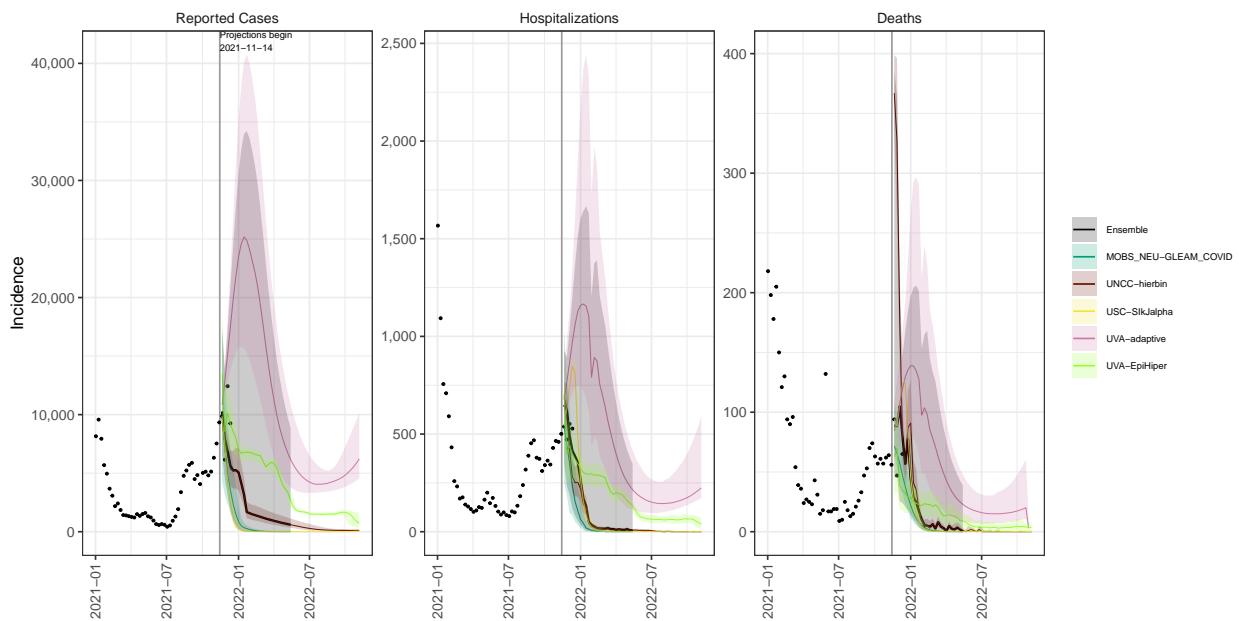
### NH model variance & 95% projection intervals – Optimistic waning, high booster coverage



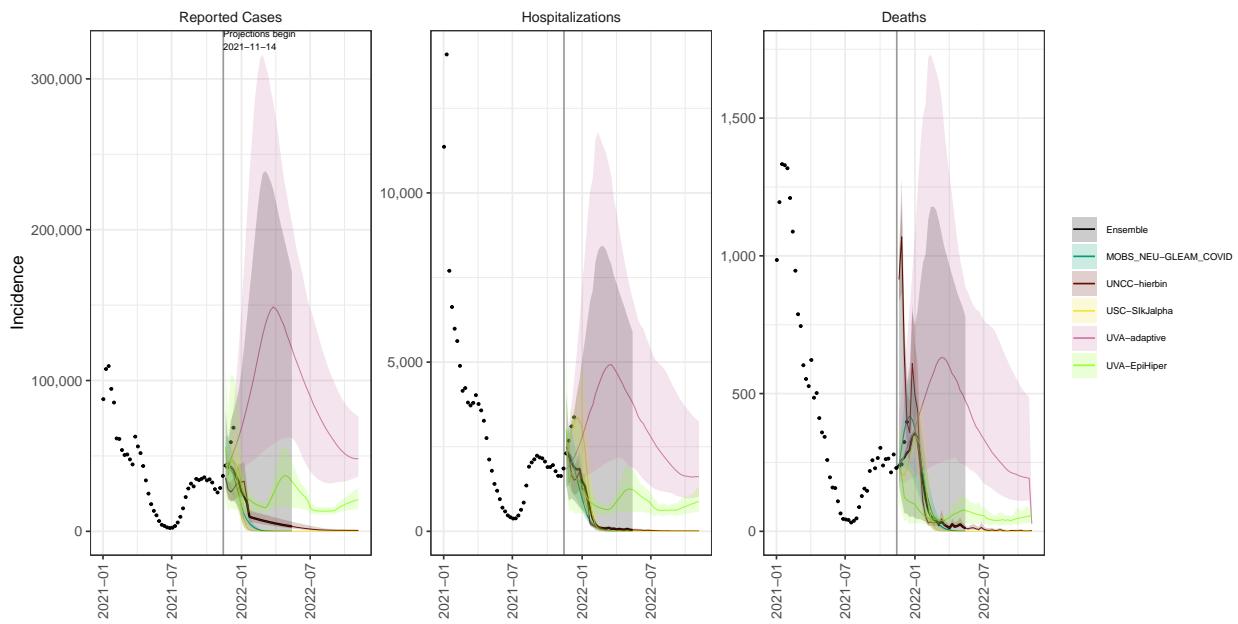
### NJ model variance & 95% projection intervals – Optimistic waning, high booster coverage



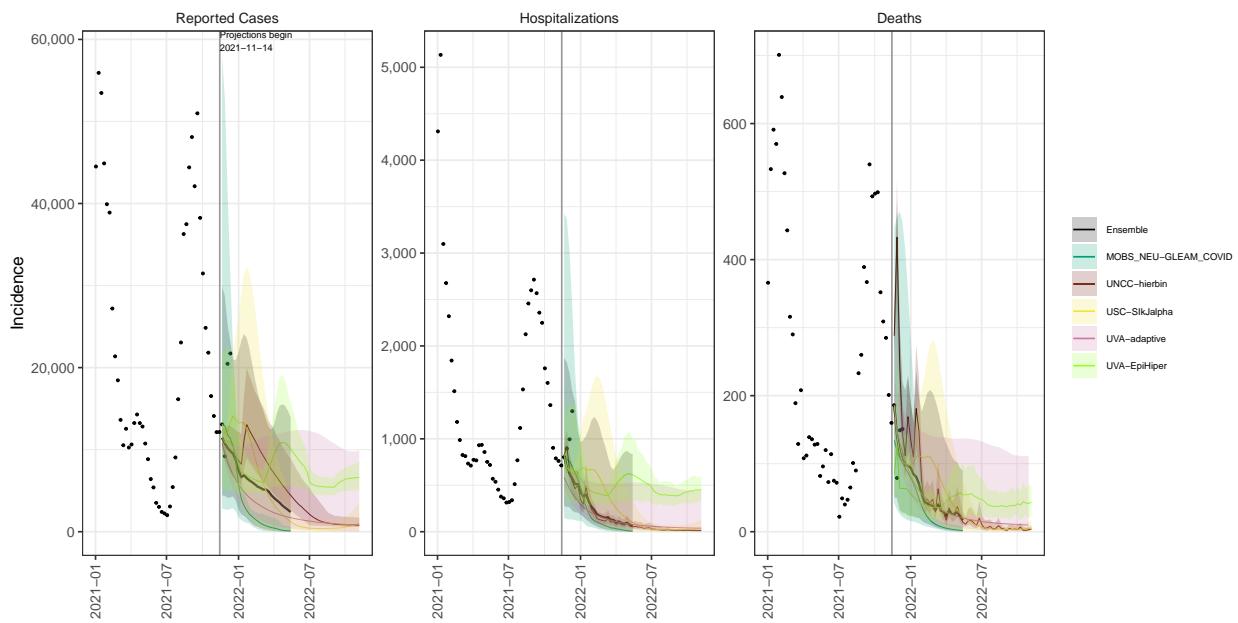
### NM model variance & 95% projection intervals – Optimistic waning, high booster coverage



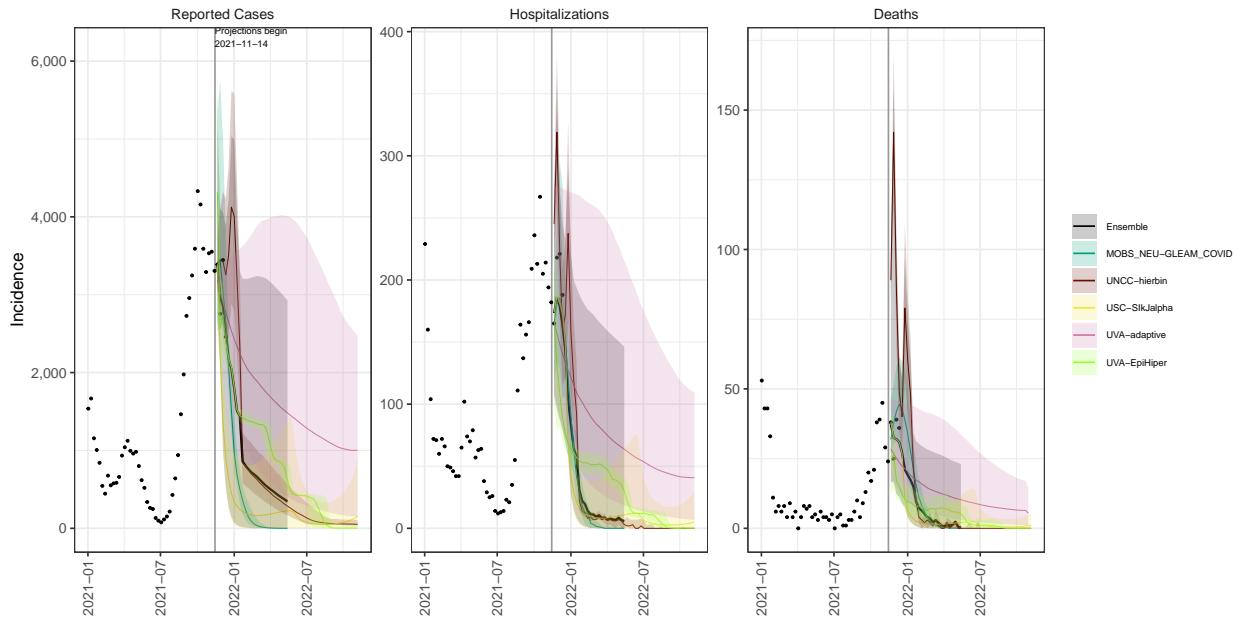
NY model variance & 95% projection intervals – Optimistic waning, high booster coverage



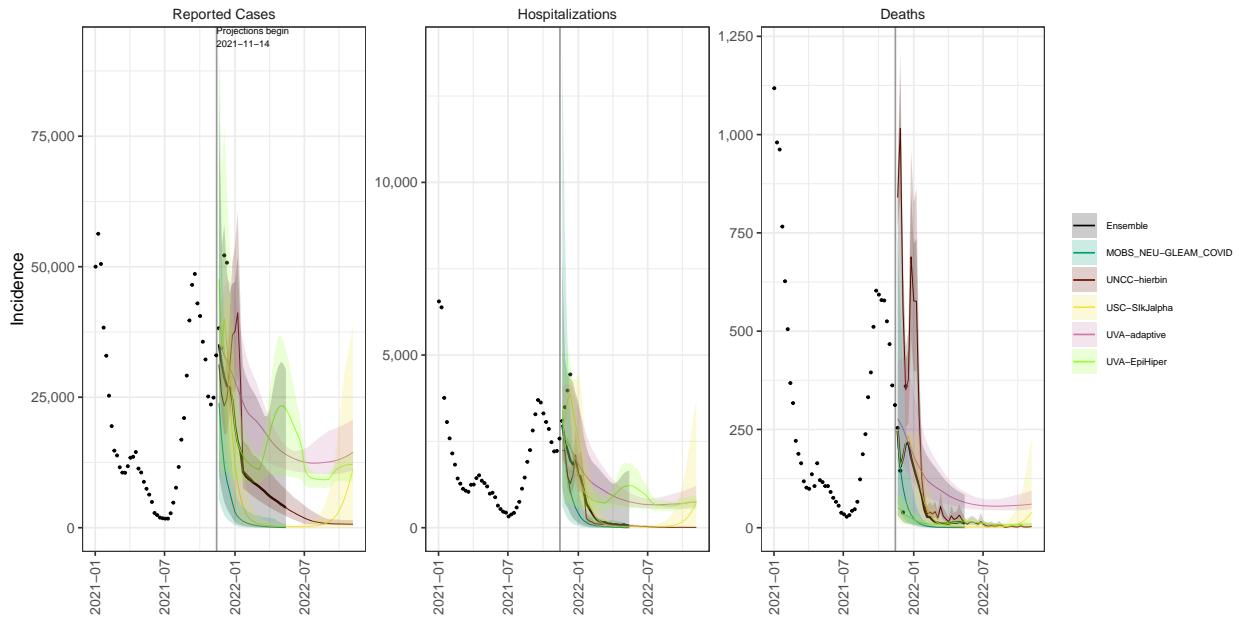
NC model variance & 95% projection intervals – Optimistic waning, high booster coverage



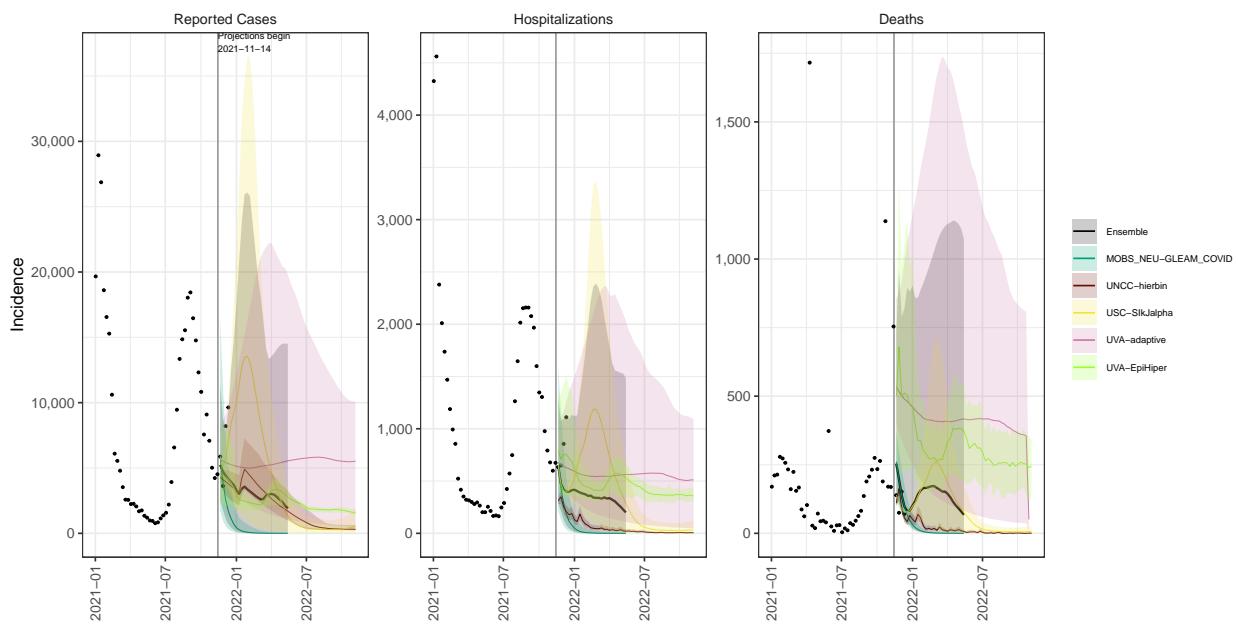
ND model variance & 95% projection intervals – Optimistic waning, high booster coverage



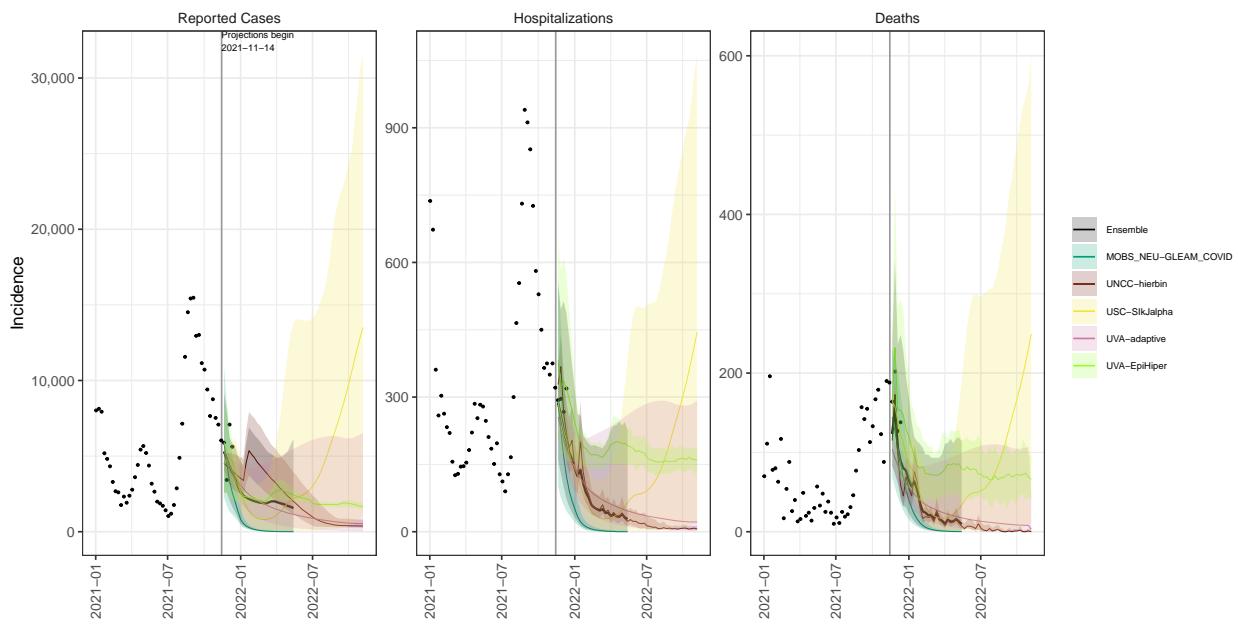
OH model variance & 95% projection intervals – Optimistic waning, high booster coverage



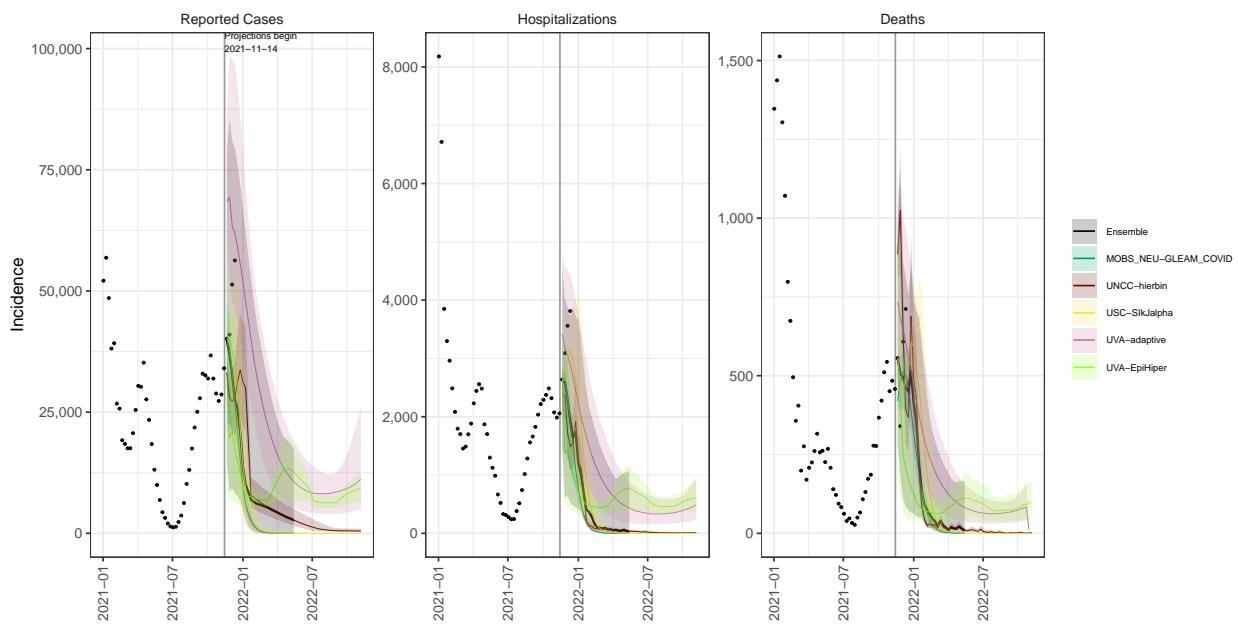
OK model variance & 95% projection intervals – Optimistic waning, high booster coverage



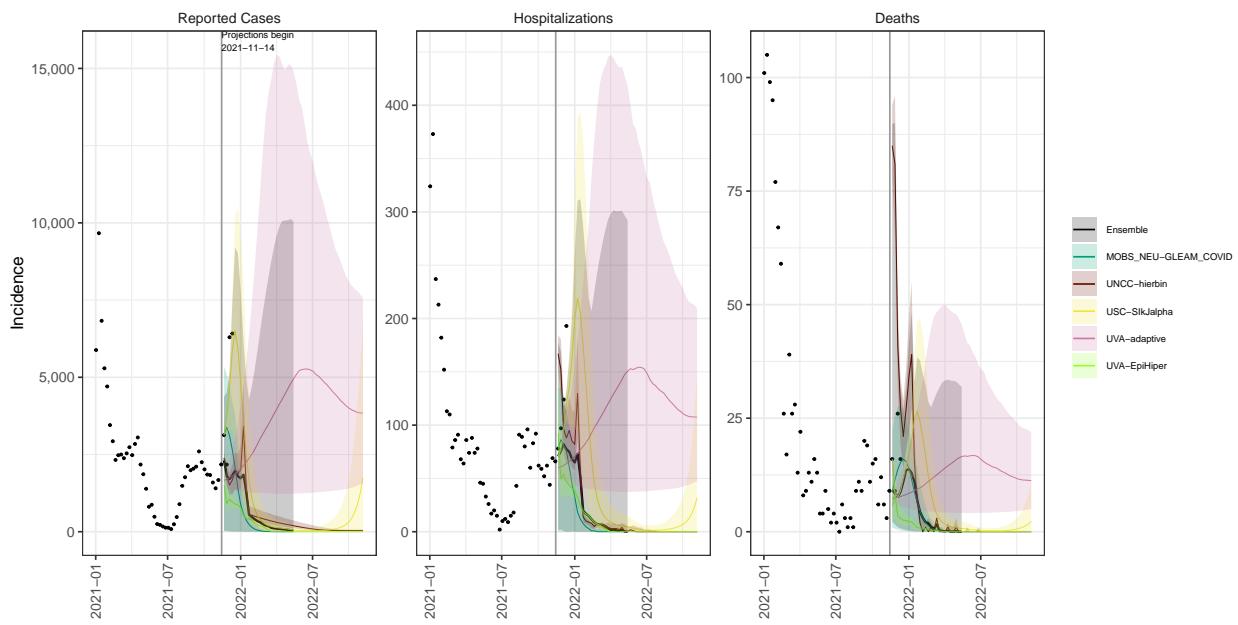
OR model variance & 95% projection intervals – Optimistic waning, high booster coverage



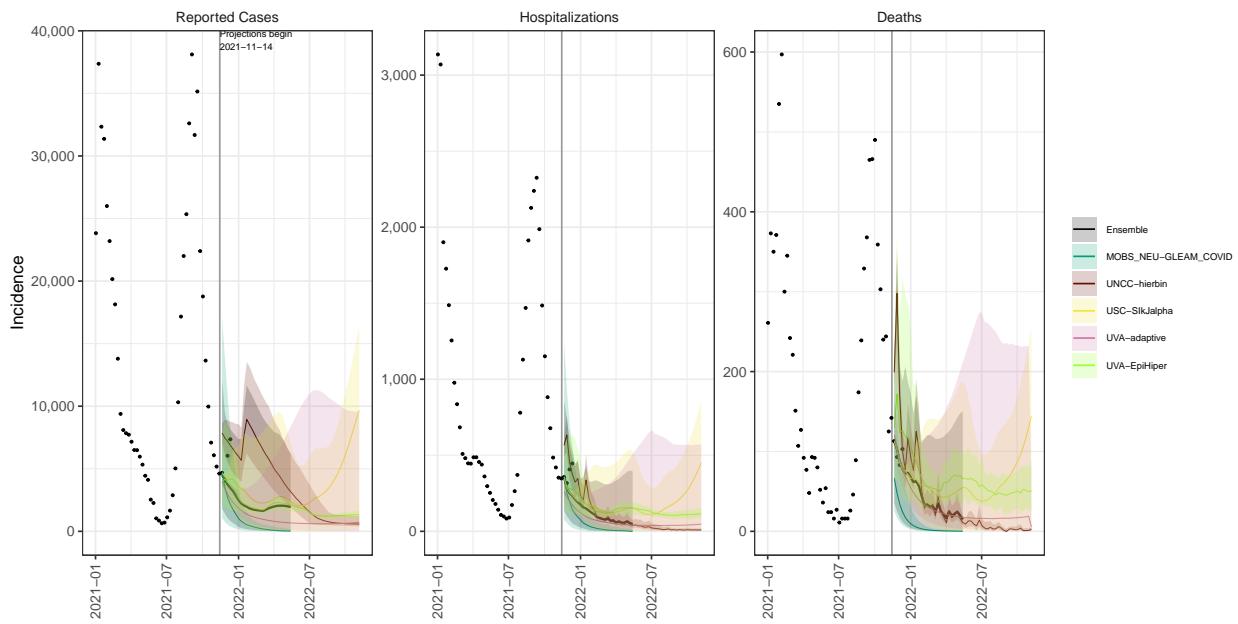
PA model variance & 95% projection intervals – Optimistic waning, high booster coverage



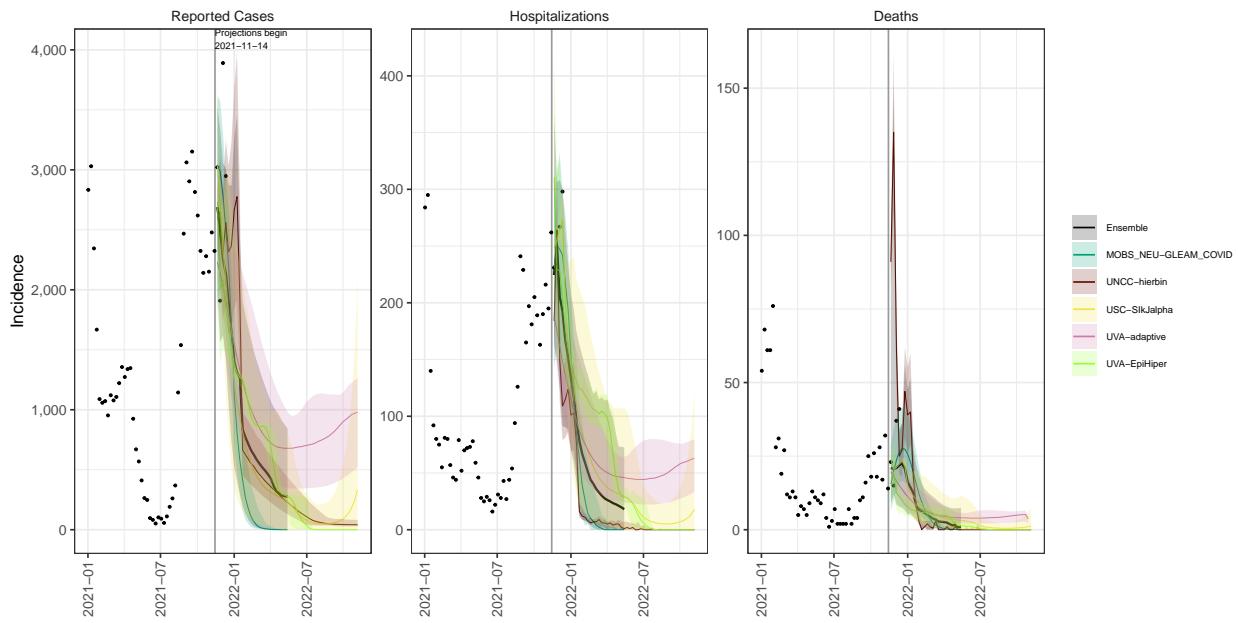
RI model variance & 95% projection intervals – Optimistic waning, high booster coverage



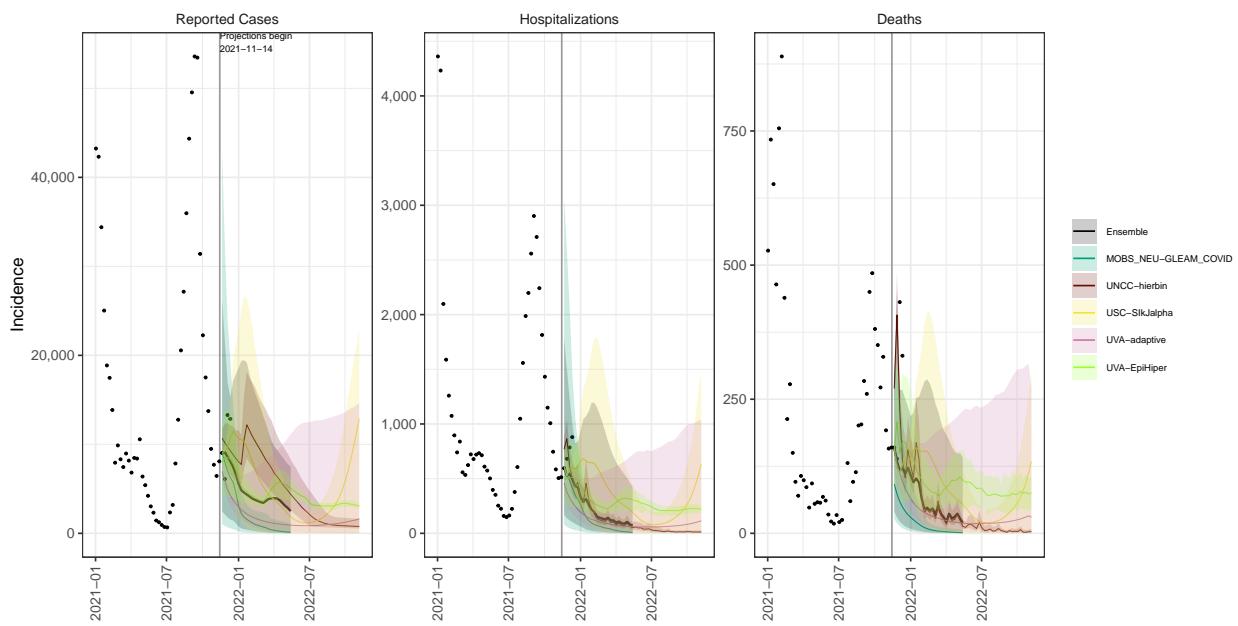
### SC model variance & 95% projection intervals – Optimistic waning, high booster coverage



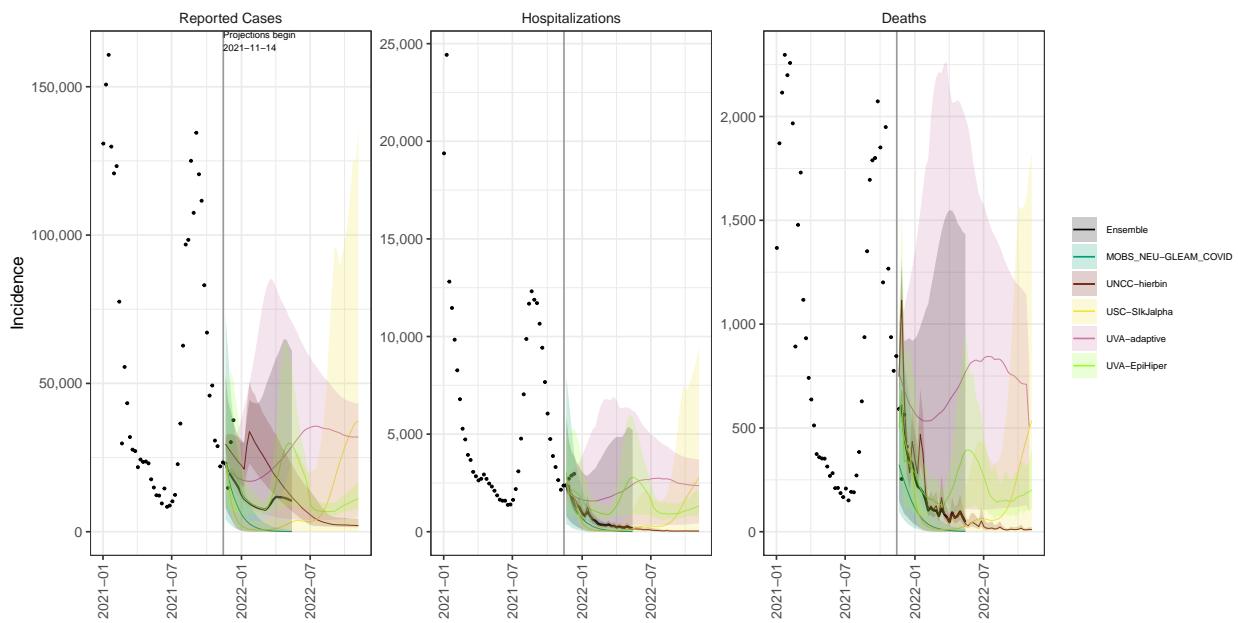
### SD model variance & 95% projection intervals – Optimistic waning, high booster coverage



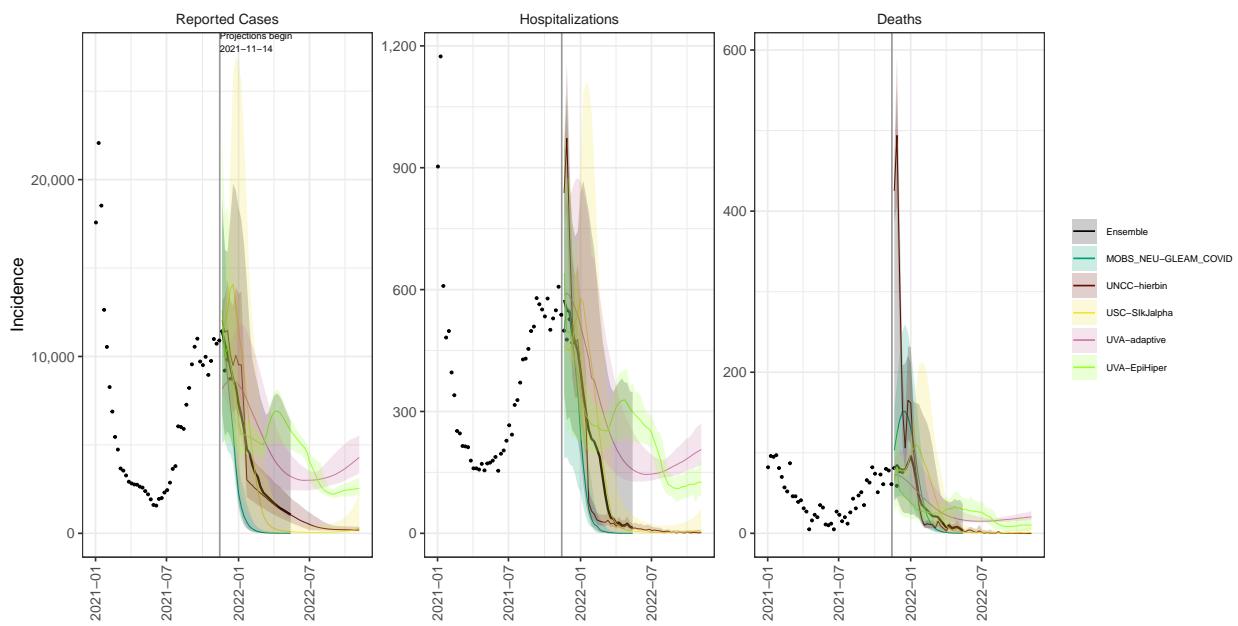
TN model variance & 95% projection intervals – Optimistic waning, high booster coverage



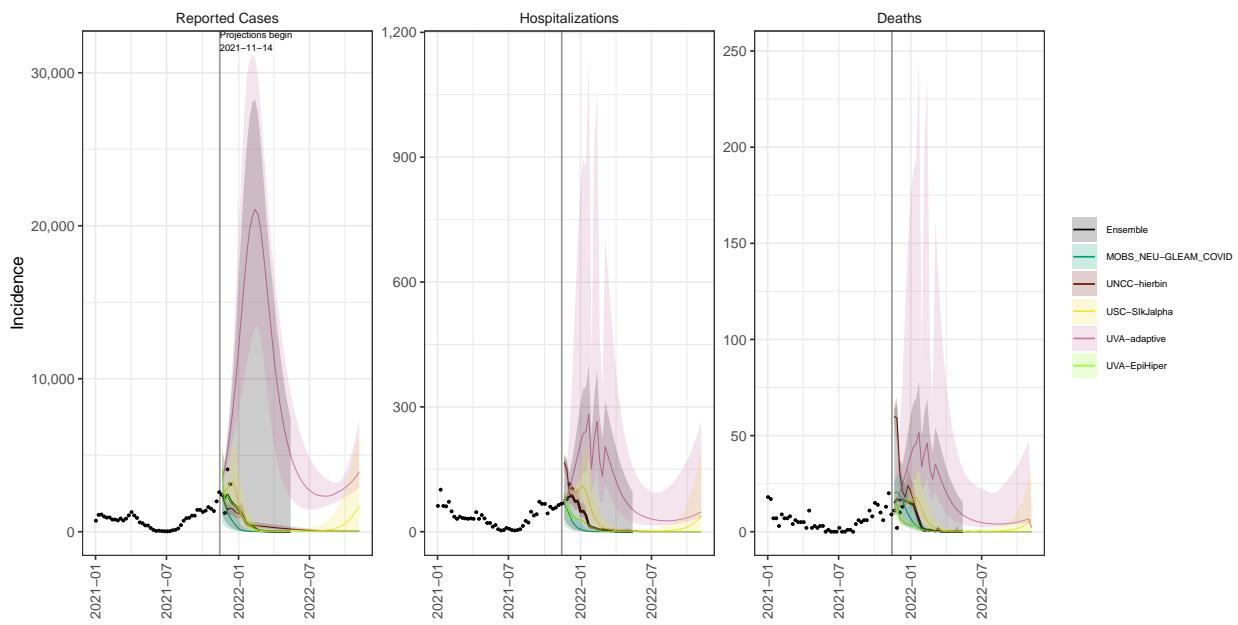
TX model variance & 95% projection intervals – Optimistic waning, high booster coverage



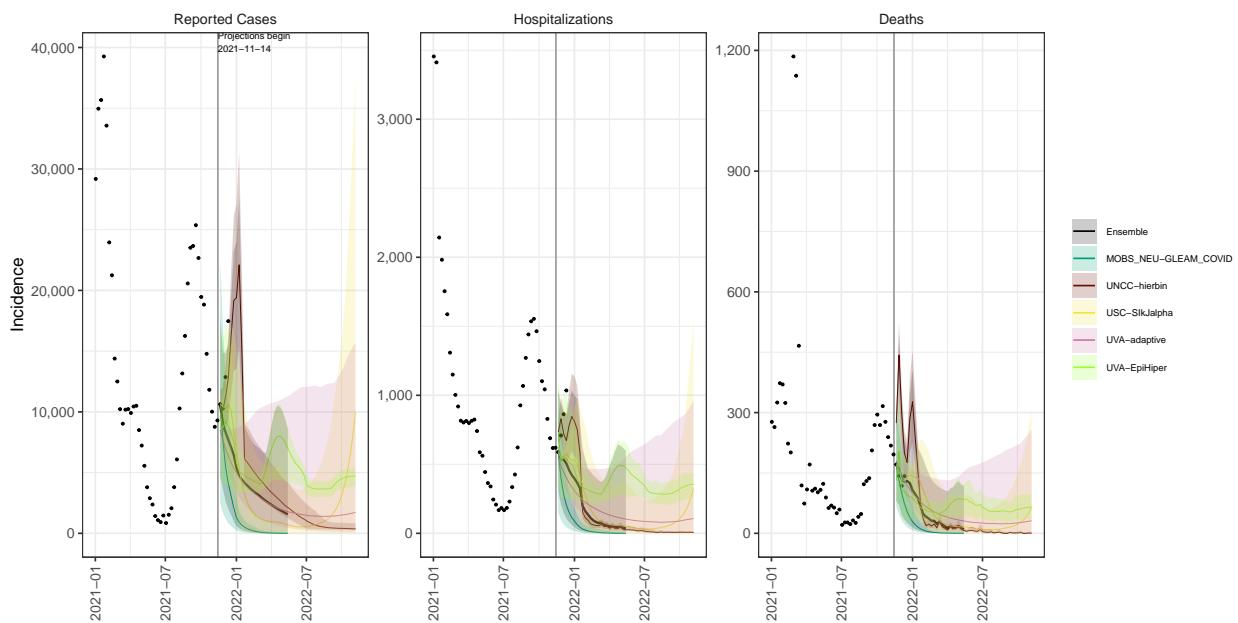
UT model variance & 95% projection intervals – Optimistic waning, high booster coverage



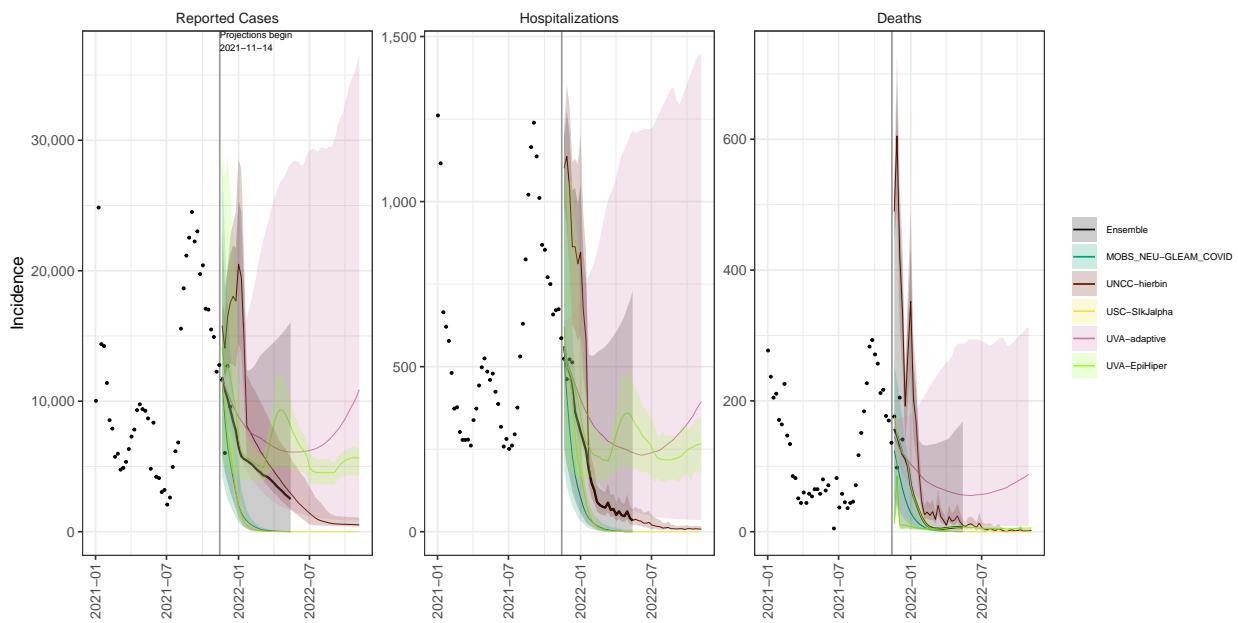
VT model variance & 95% projection intervals – Optimistic waning, high booster coverage



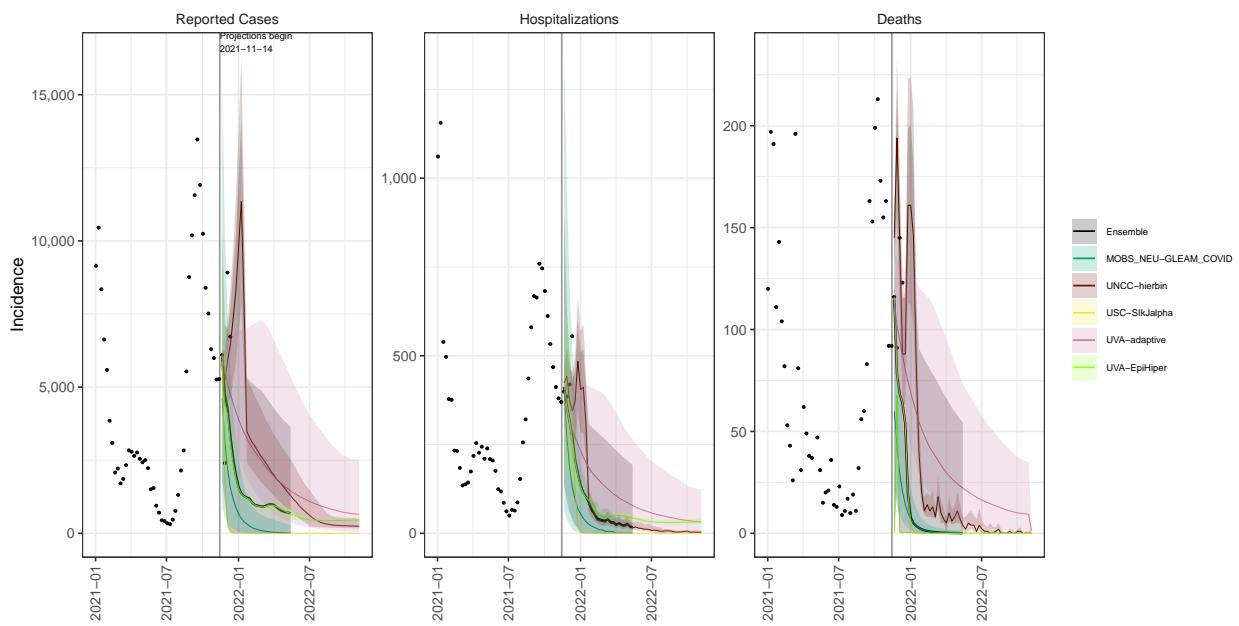
VA model variance & 95% projection intervals – Optimistic waning, high booster coverage



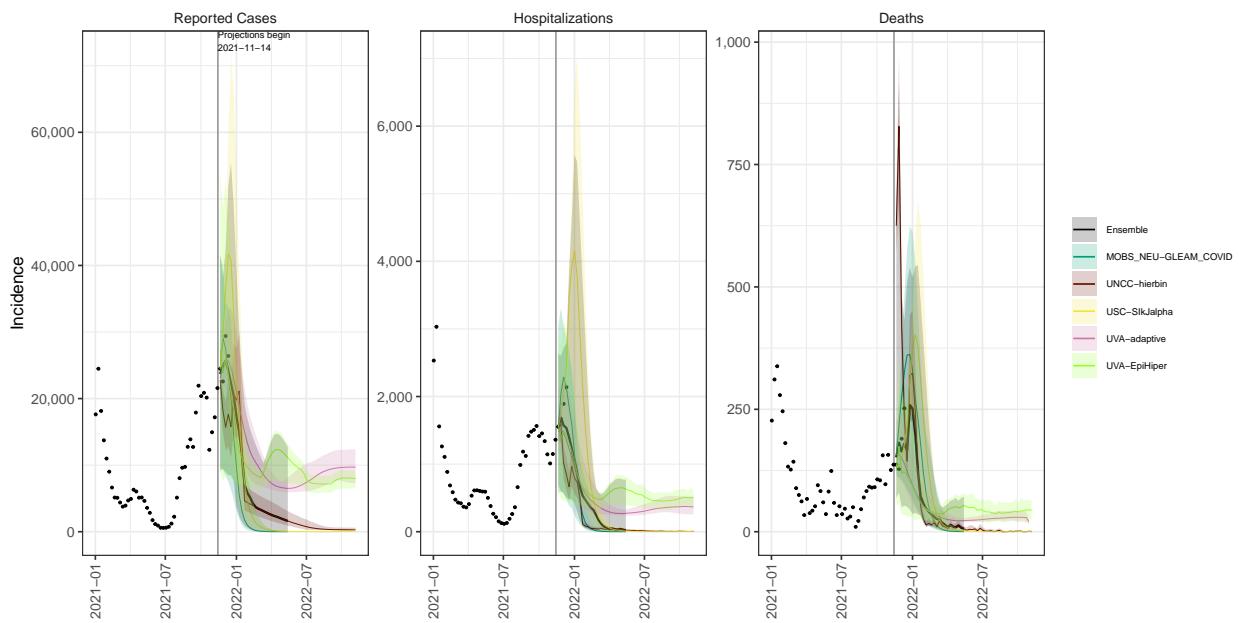
WA model variance & 95% projection intervals – Optimistic waning, high booster coverage



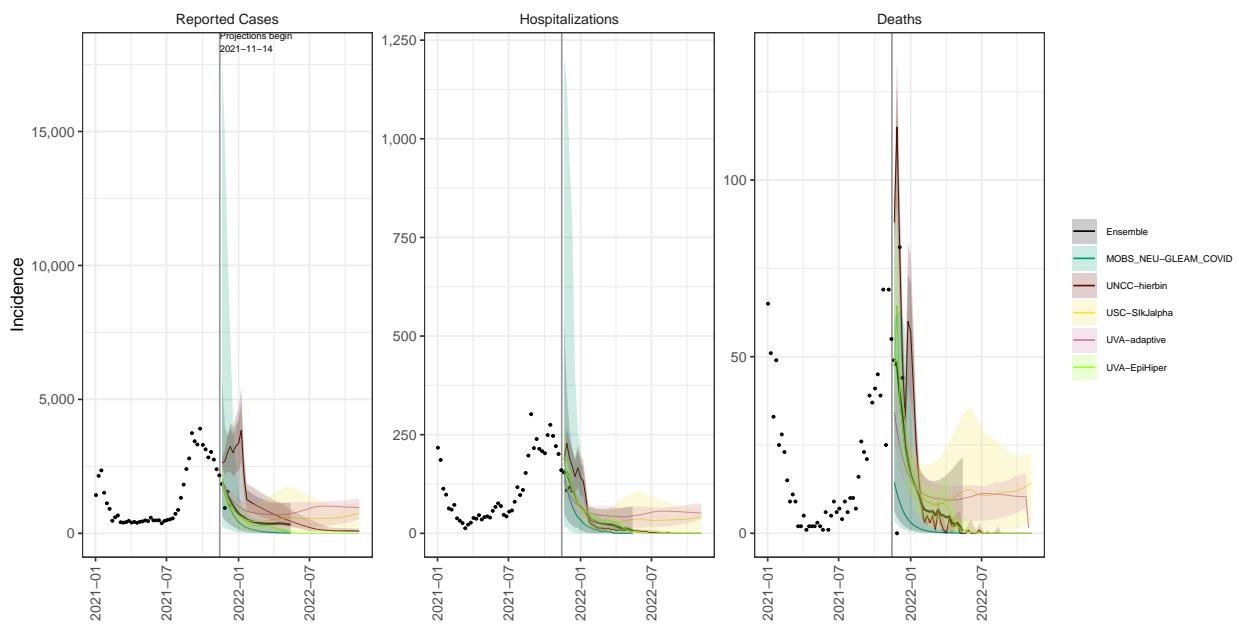
WV model variance & 95% projection intervals – Optimistic waning, high booster coverage



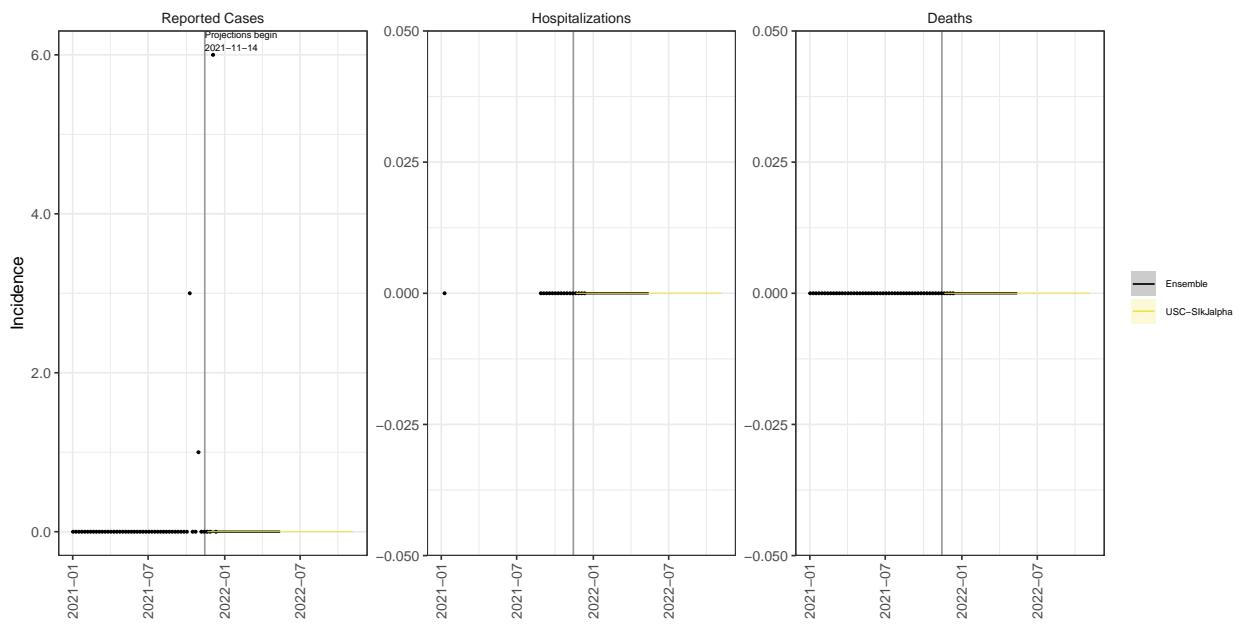
WI model variance & 95% projection intervals – Optimistic waning, high booster coverage



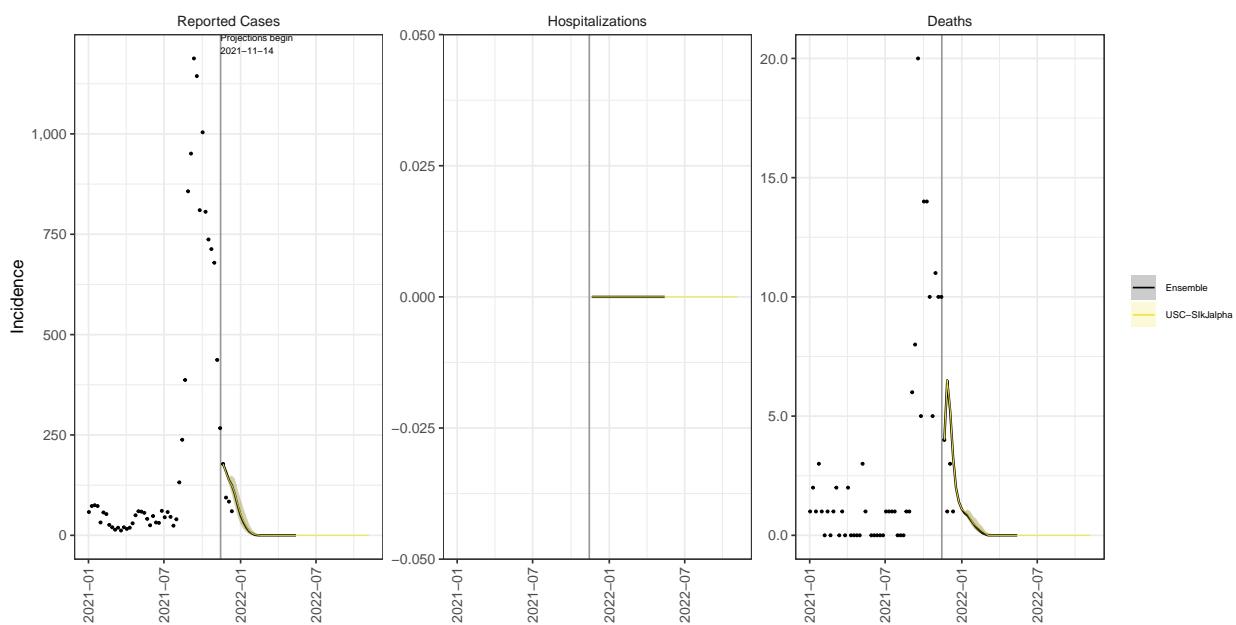
### WY model variance & 95% projection intervals – Optimistic waning, high booster coverage



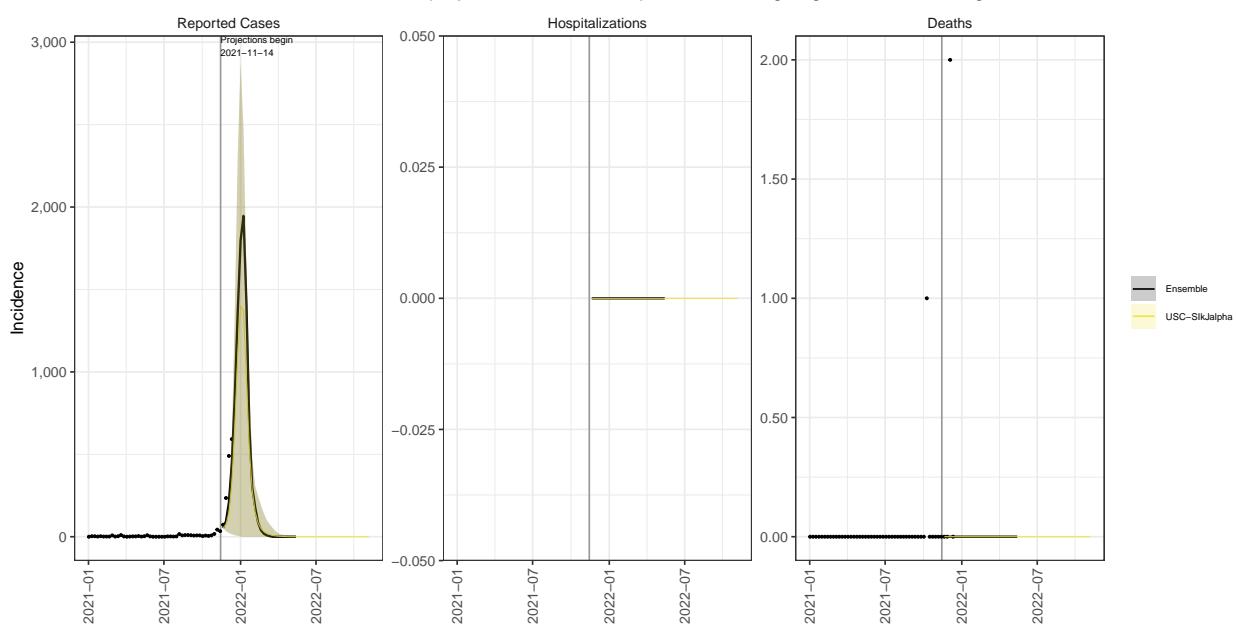
### AS model variance & 95% projection intervals – Optimistic waning, high booster coverage



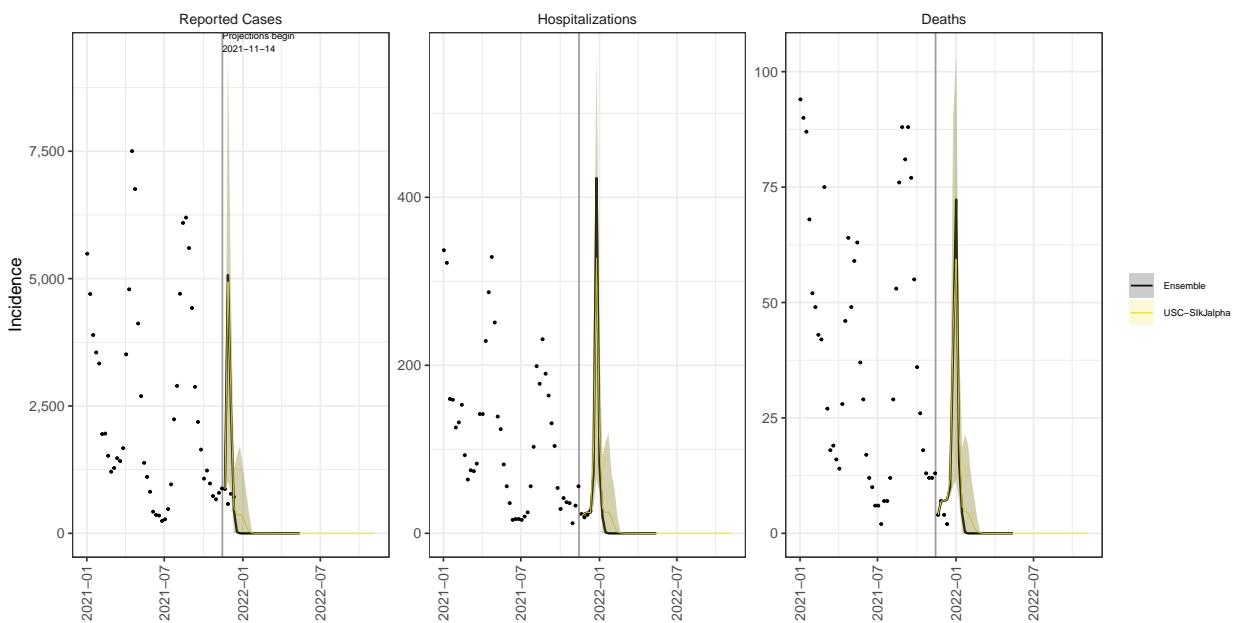
GU model variance & 95% projection intervals – Optimistic waning, high booster coverage



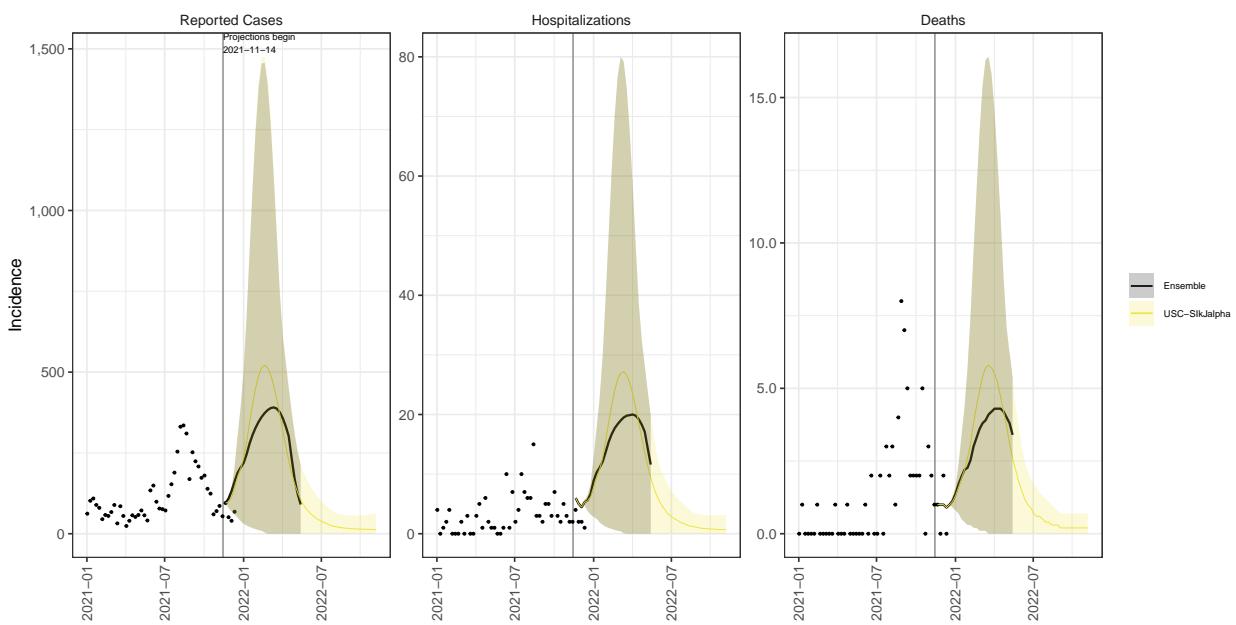
MP model variance & 95% projection intervals – Optimistic waning, high booster coverage



PR model variance & 95% projection intervals – Optimistic waning, high booster coverage

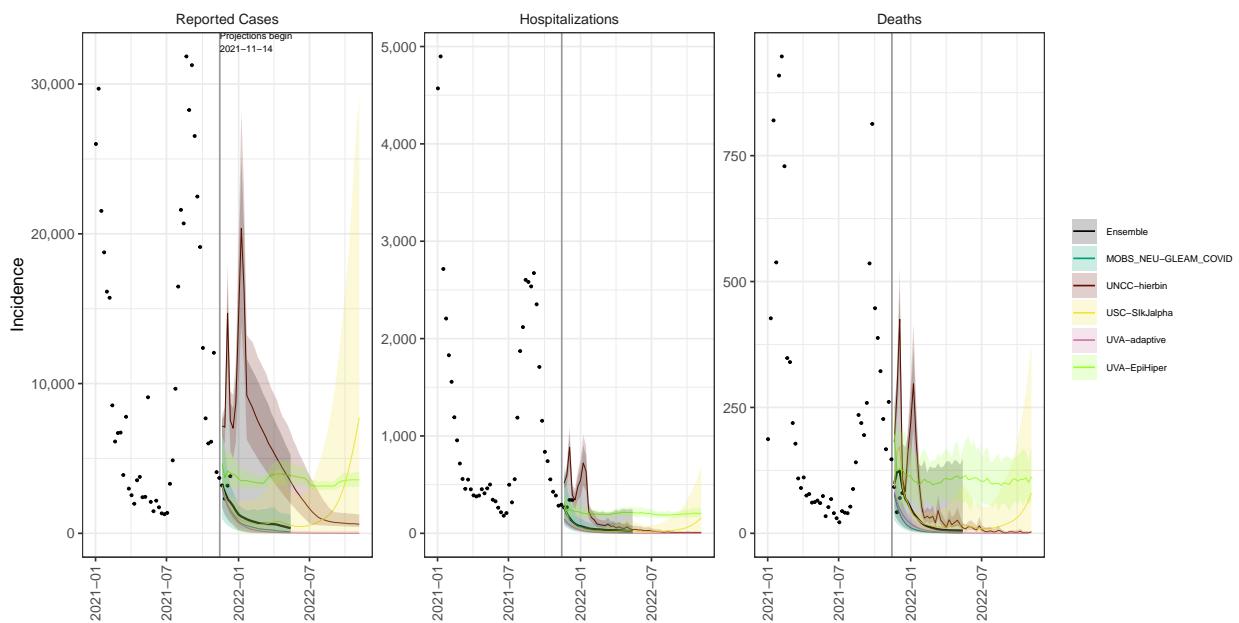


VI model variance & 95% projection intervals – Optimistic waning, high booster coverage

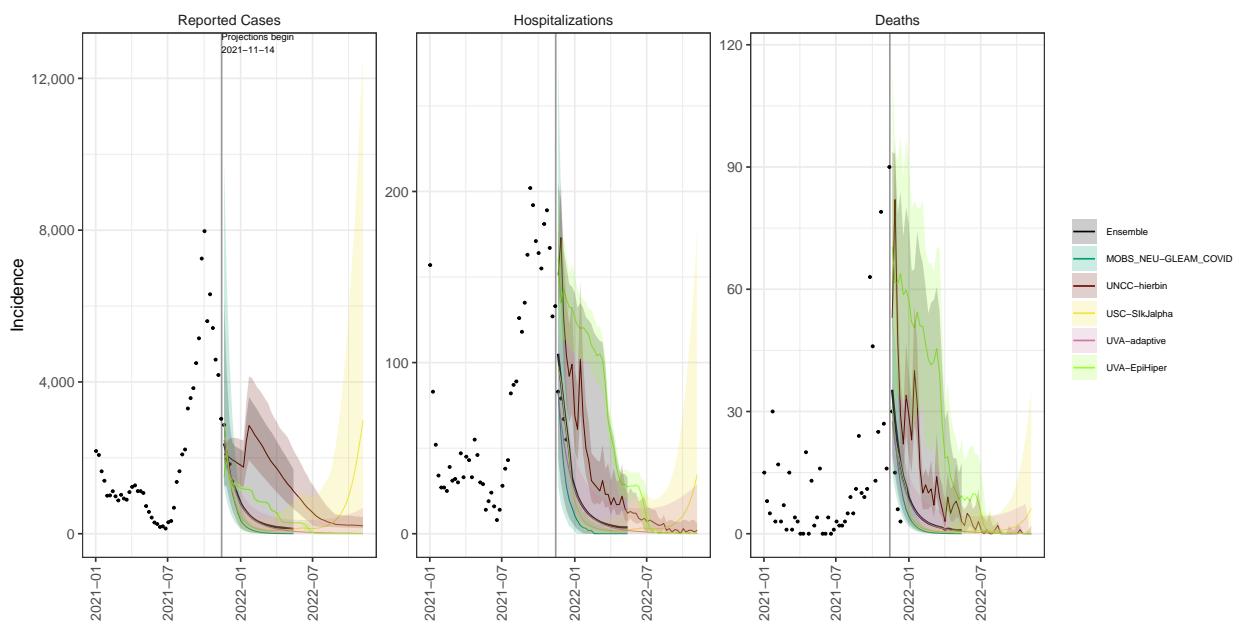


National model variation for pessimistic waning, high booster coverage scenario.

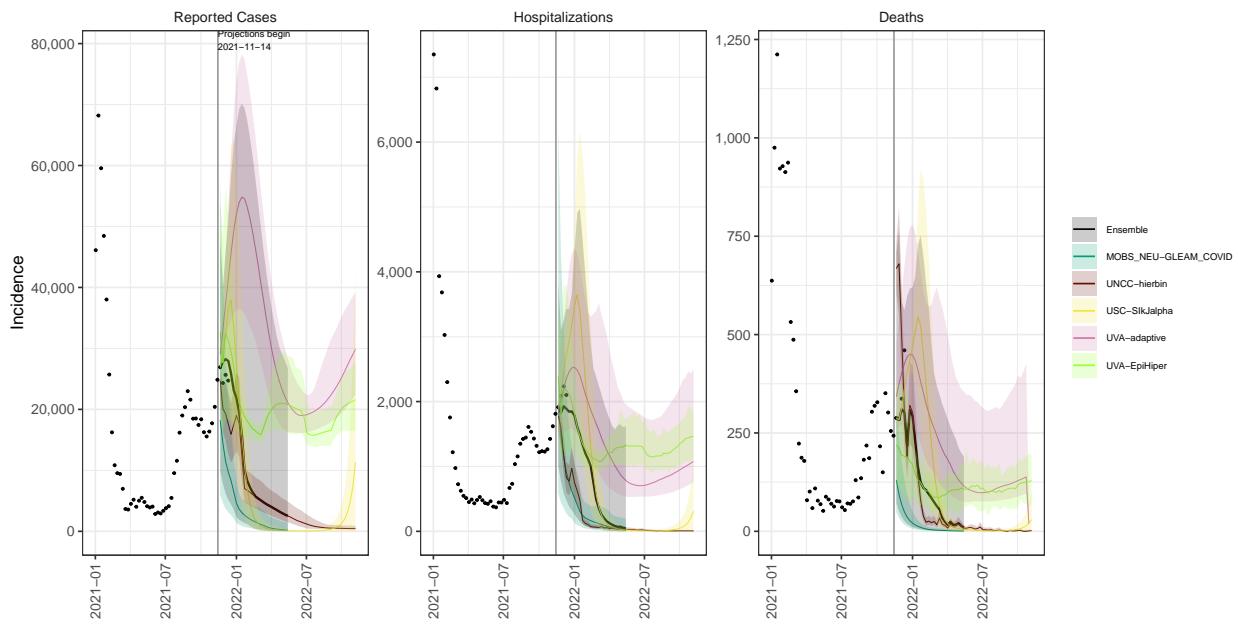
AL model variance & 95% projection intervals – Pessimistic waning, high booster coverage



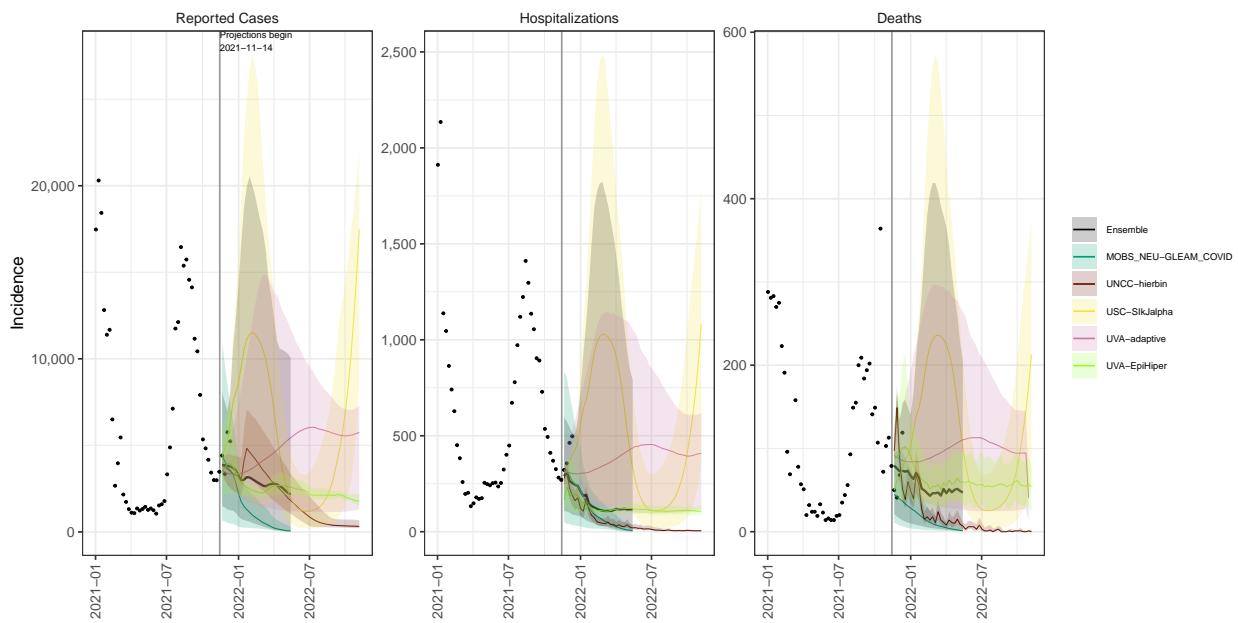
AK model variance & 95% projection intervals – Pessimistic waning, high booster coverage



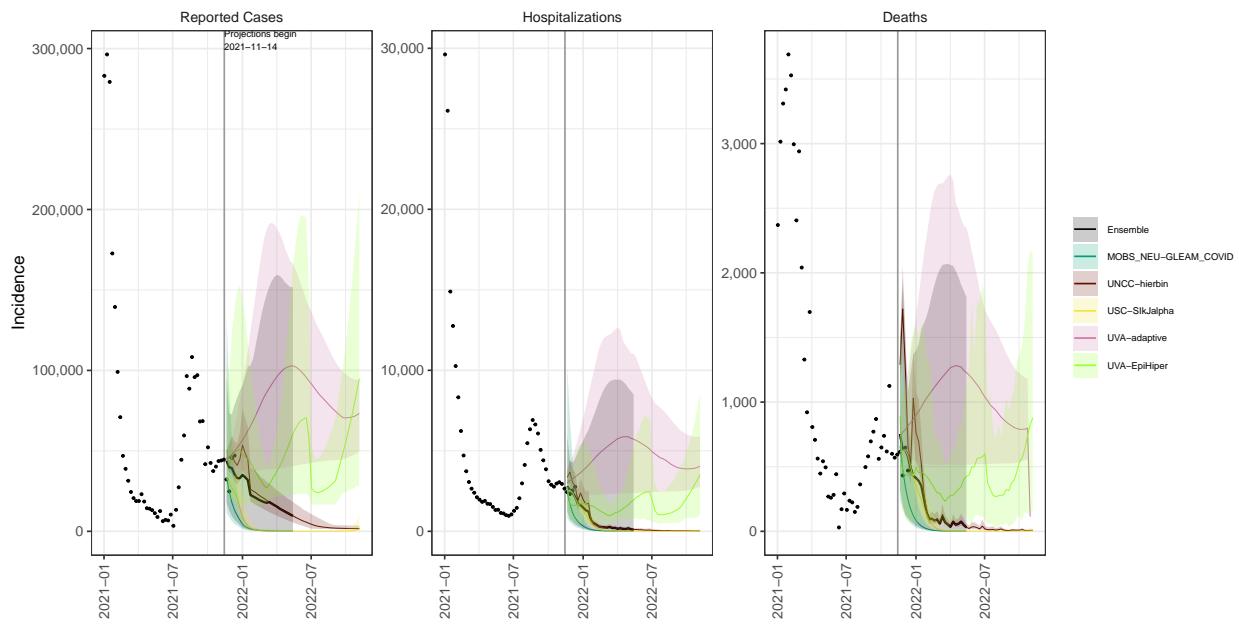
AZ model variance & 95% projection intervals – Pessimistic waning, high booster coverage



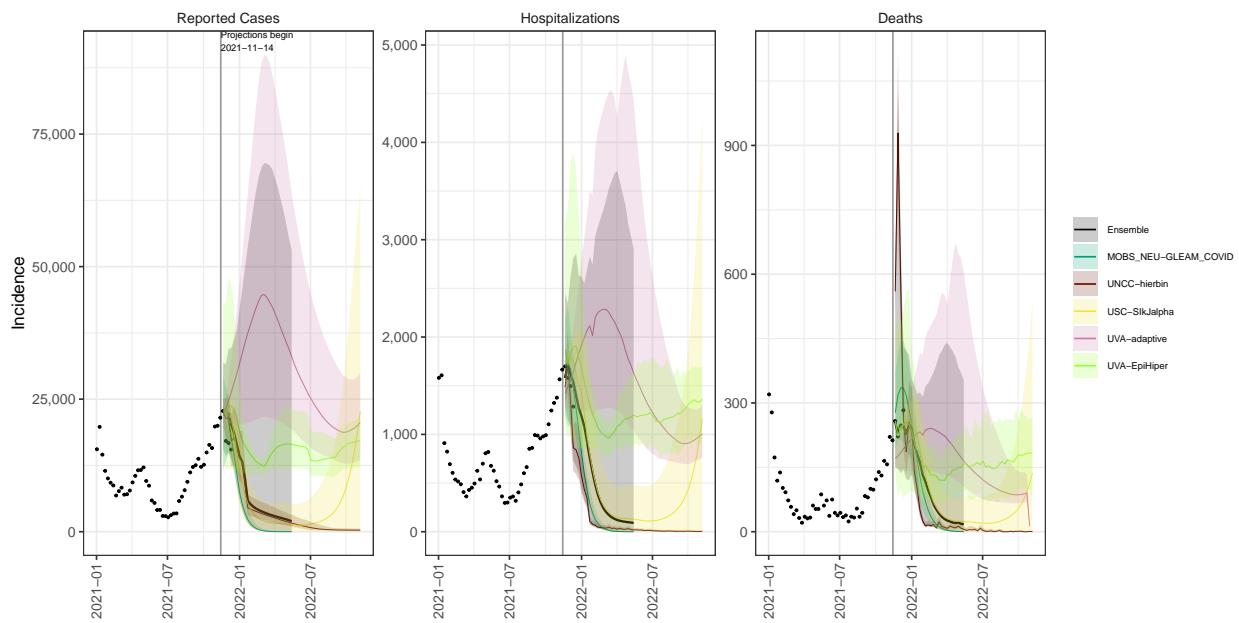
AR model variance & 95% projection intervals – Pessimistic waning, high booster coverage



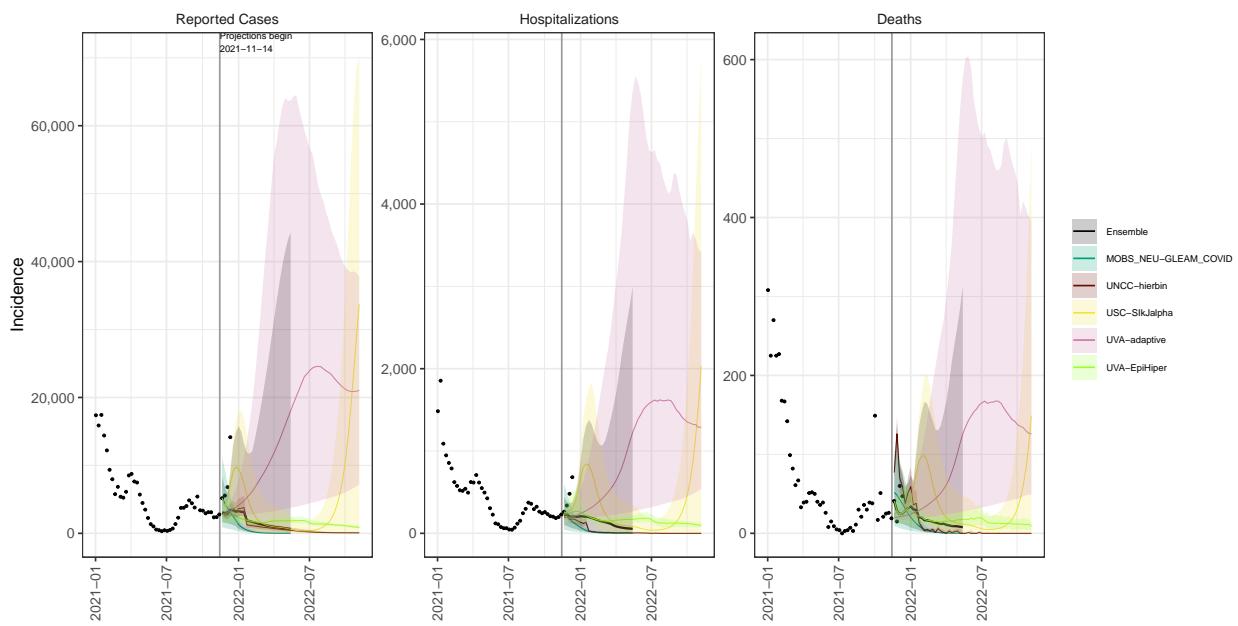
CA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



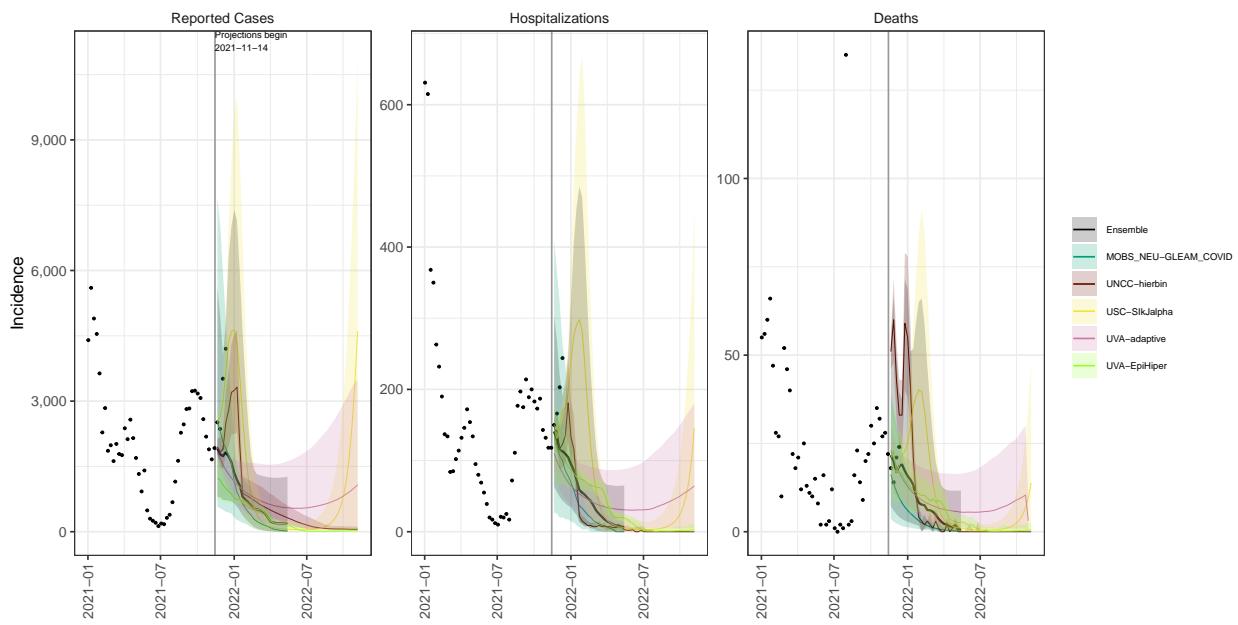
CO model variance & 95% projection intervals – Pessimistic waning, high booster coverage



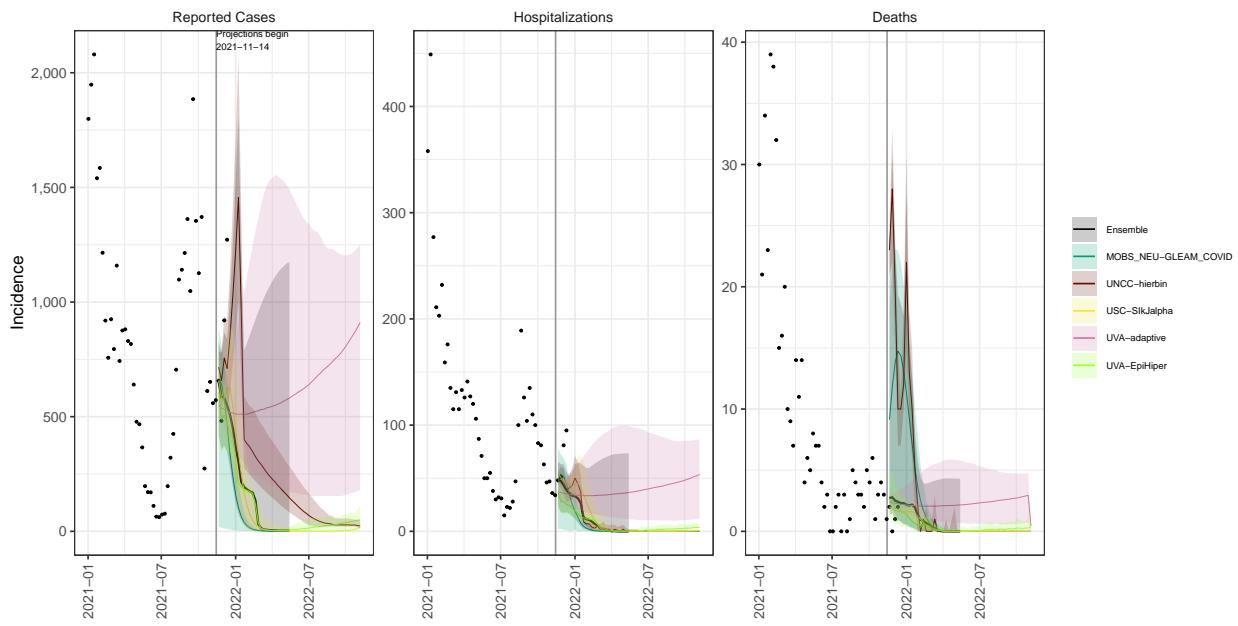
CT model variance & 95% projection intervals – Pessimistic waning, high booster coverage



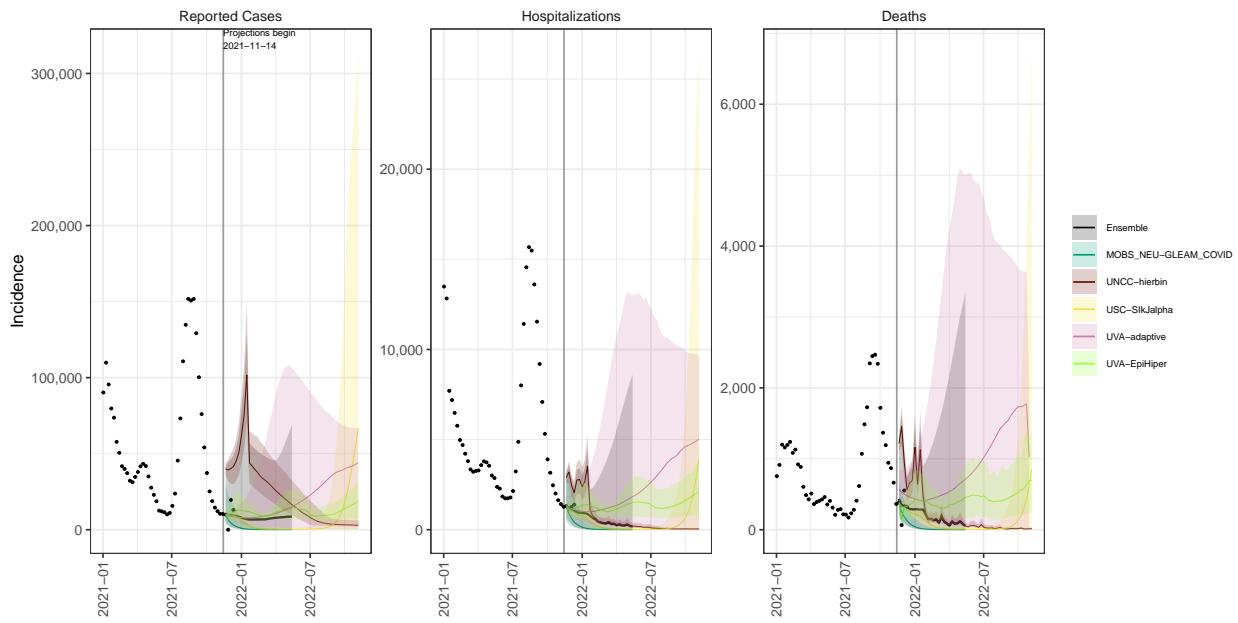
DE model variance & 95% projection intervals – Pessimistic waning, high booster coverage



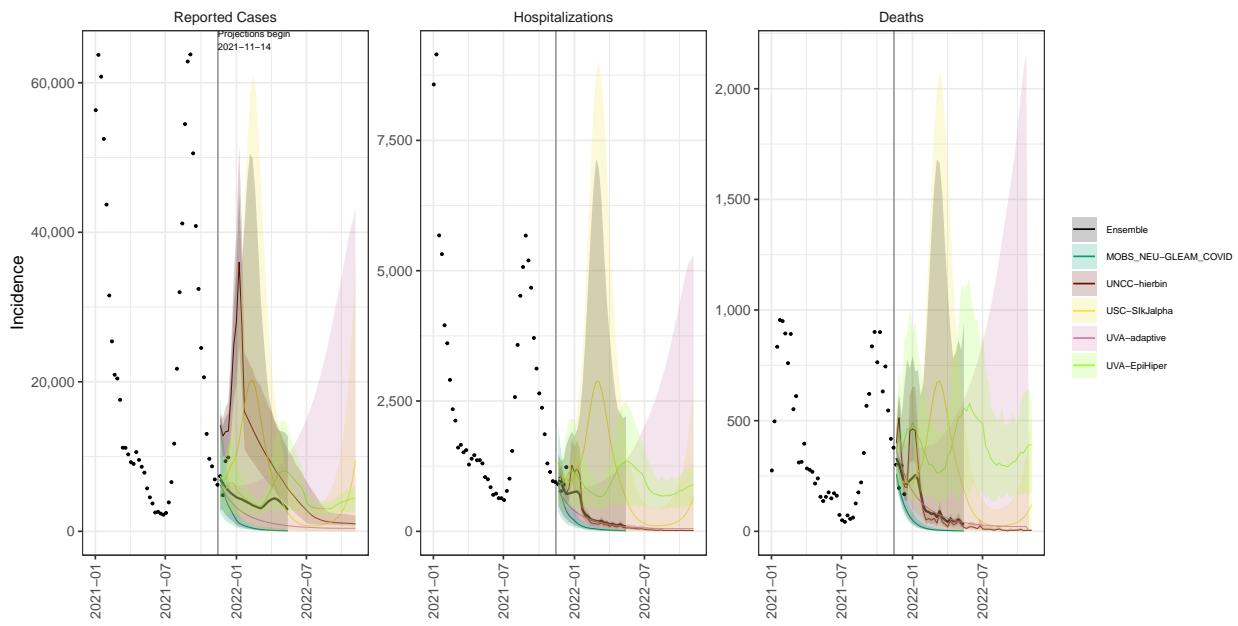
DC model variance & 95% projection intervals – Pessimistic waning, high booster coverage



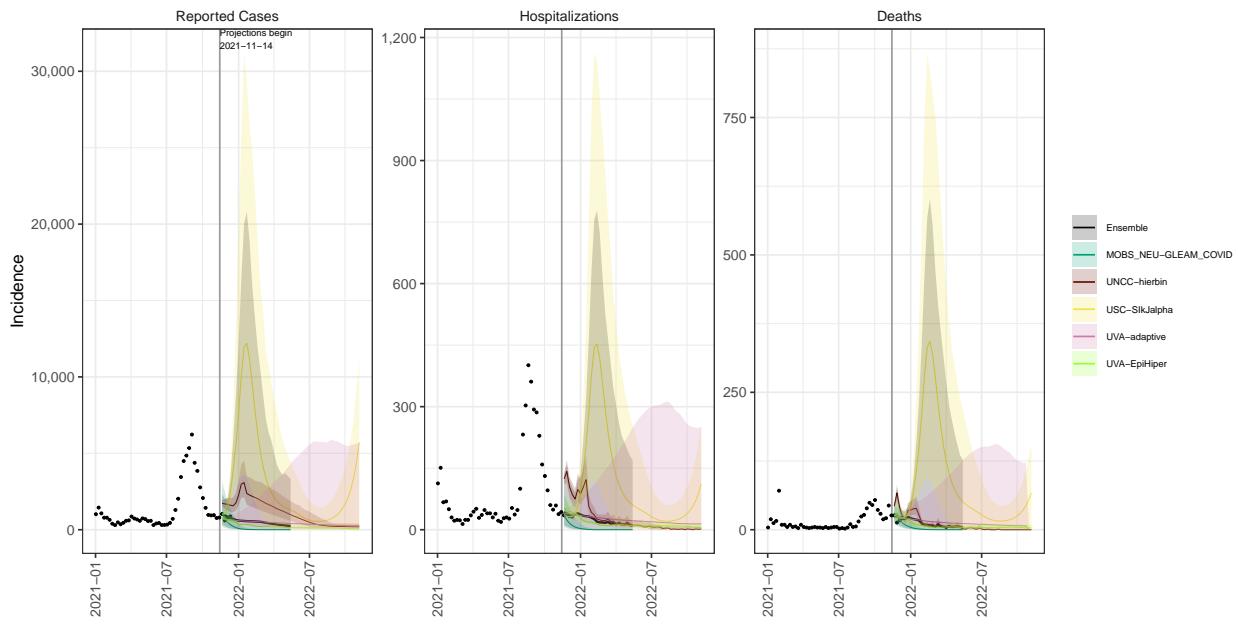
FL model variance & 95% projection intervals – Pessimistic waning, high booster coverage



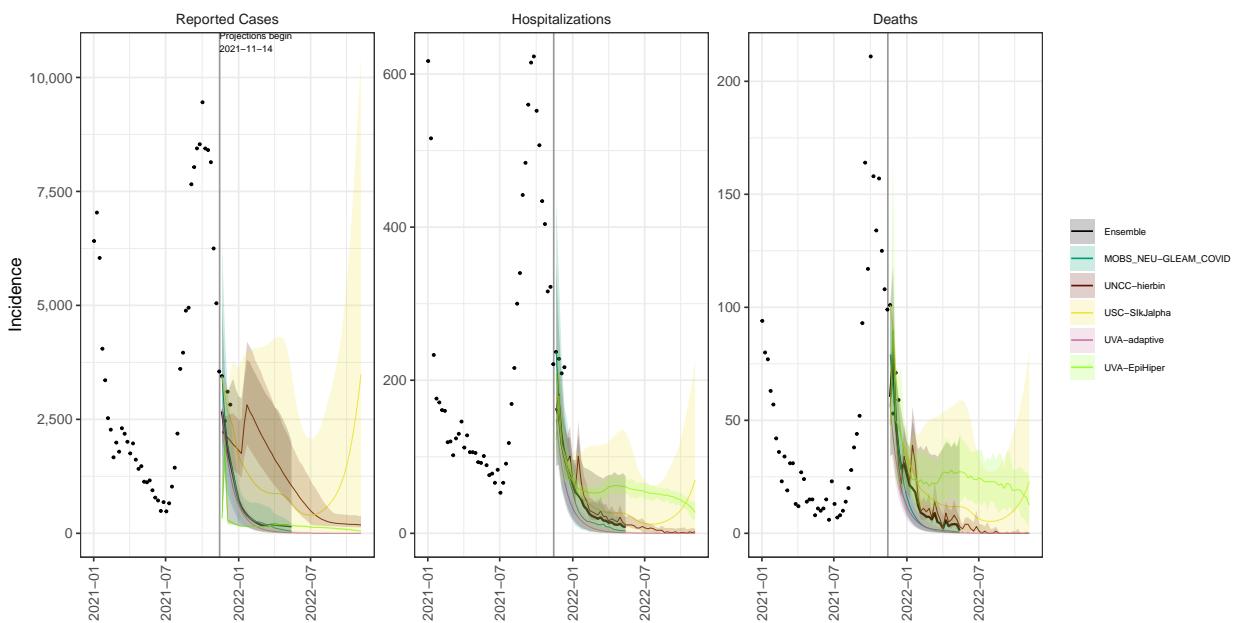
GA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



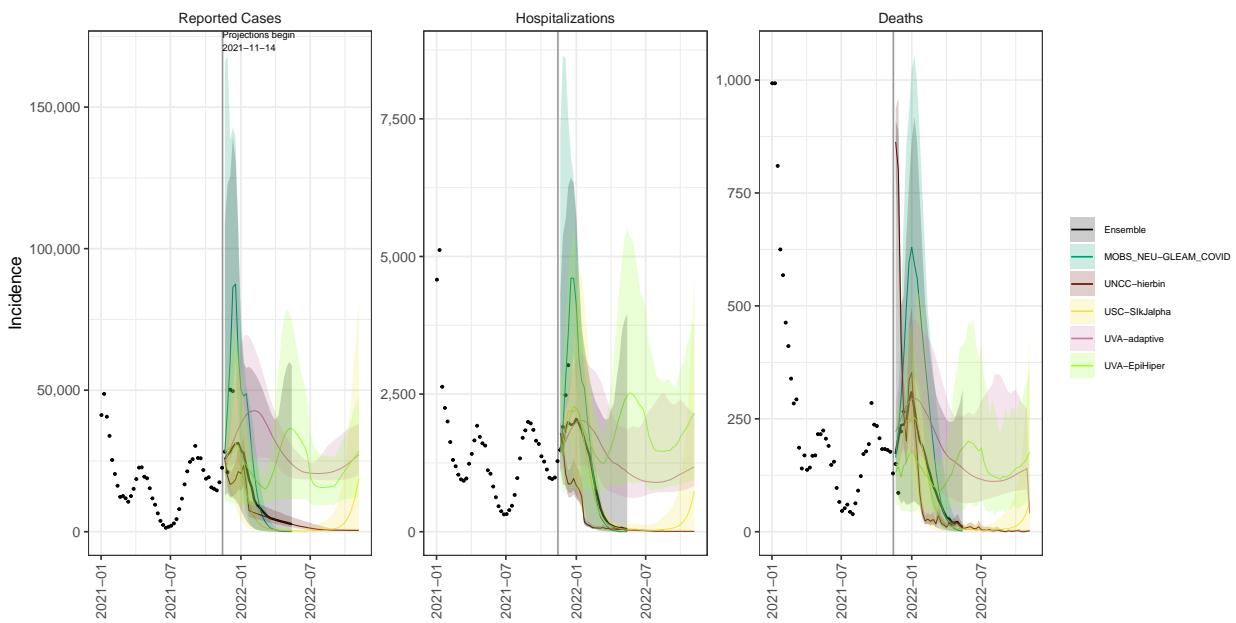
HI model variance & 95% projection intervals – Pessimistic waning, high booster coverage



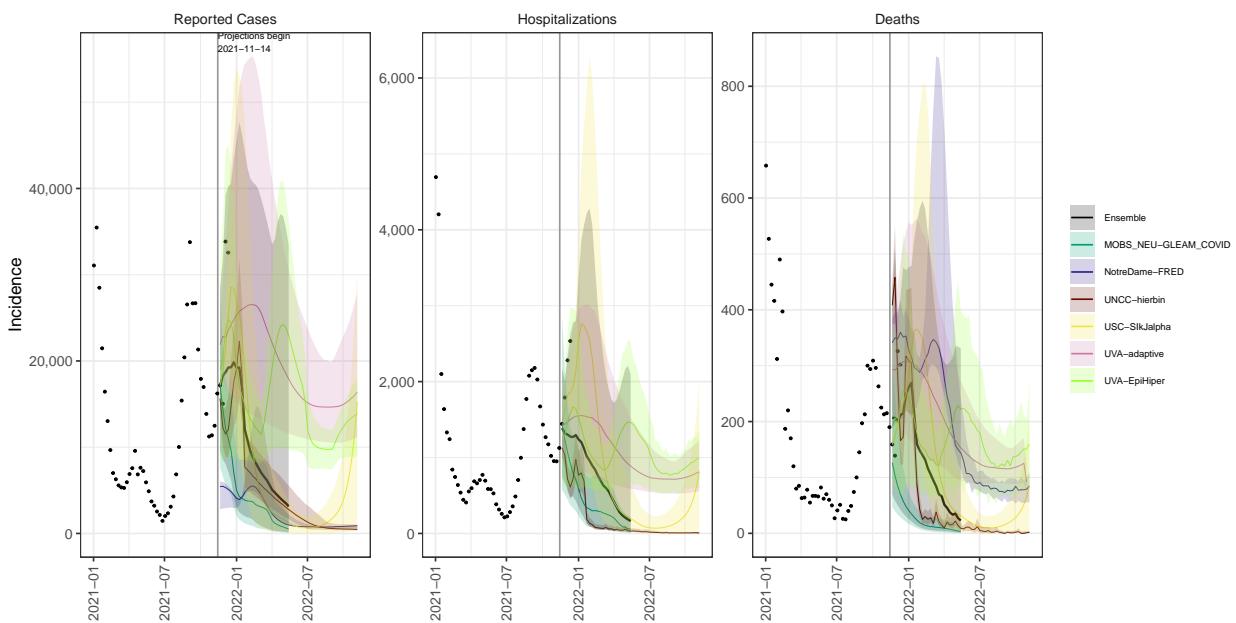
ID model variance & 95% projection intervals – Pessimistic waning, high booster coverage



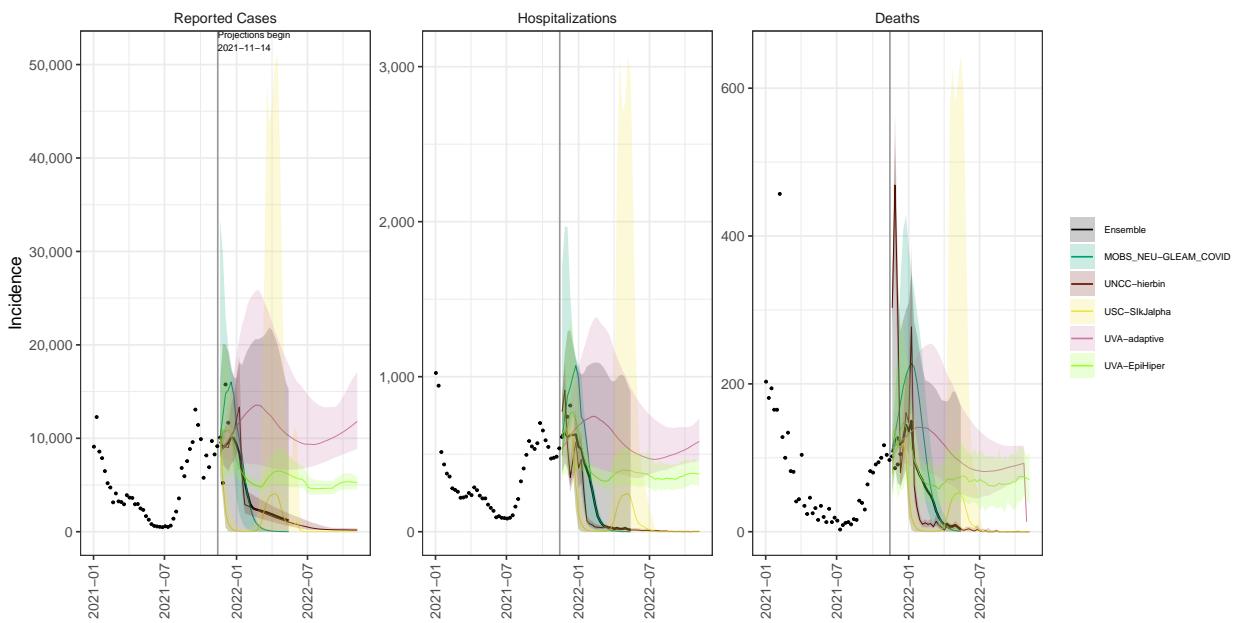
IL model variance & 95% projection intervals – Pessimistic waning, high booster coverage



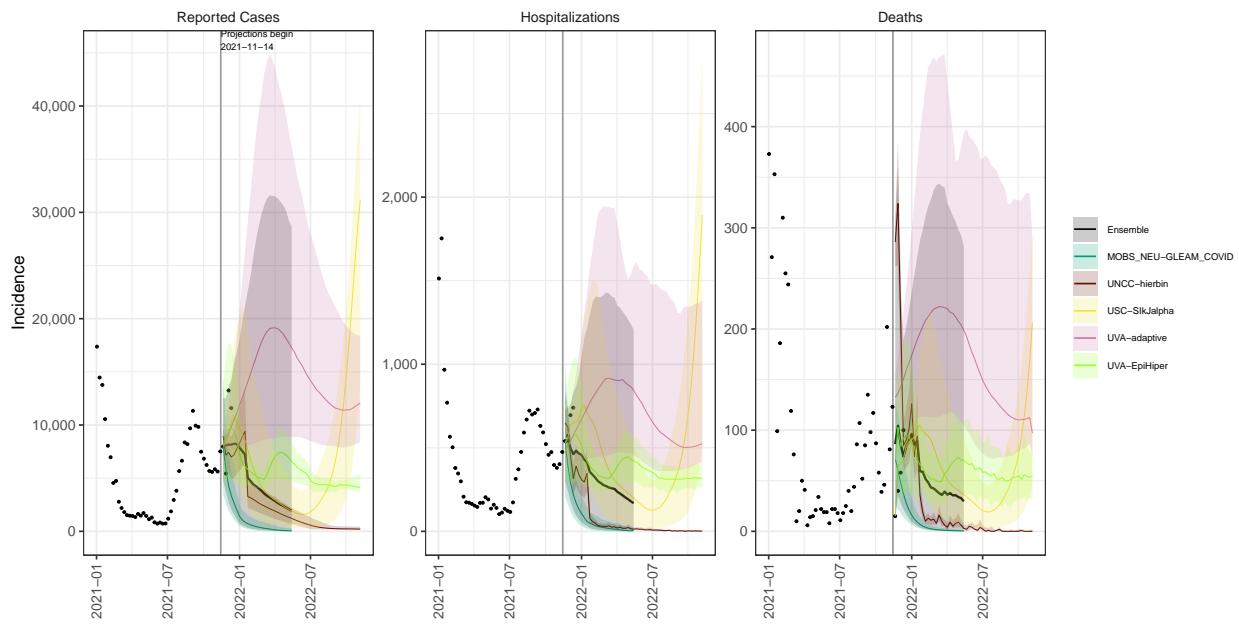
IN model variance & 95% projection intervals – Pessimistic waning, high booster coverage



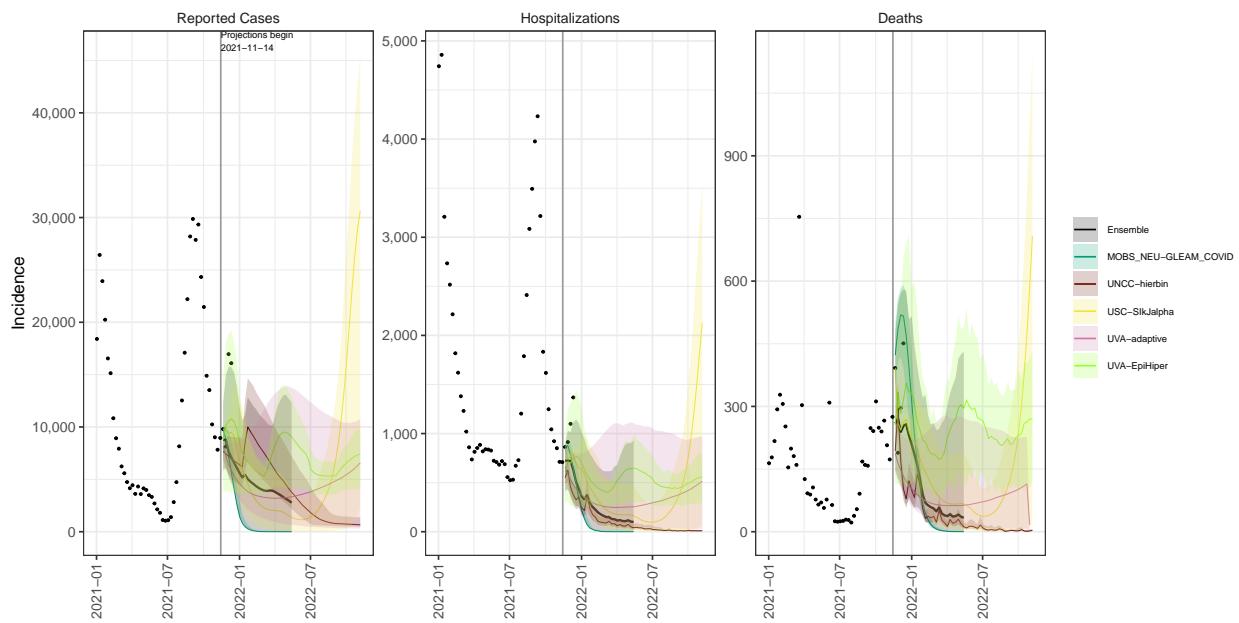
IA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



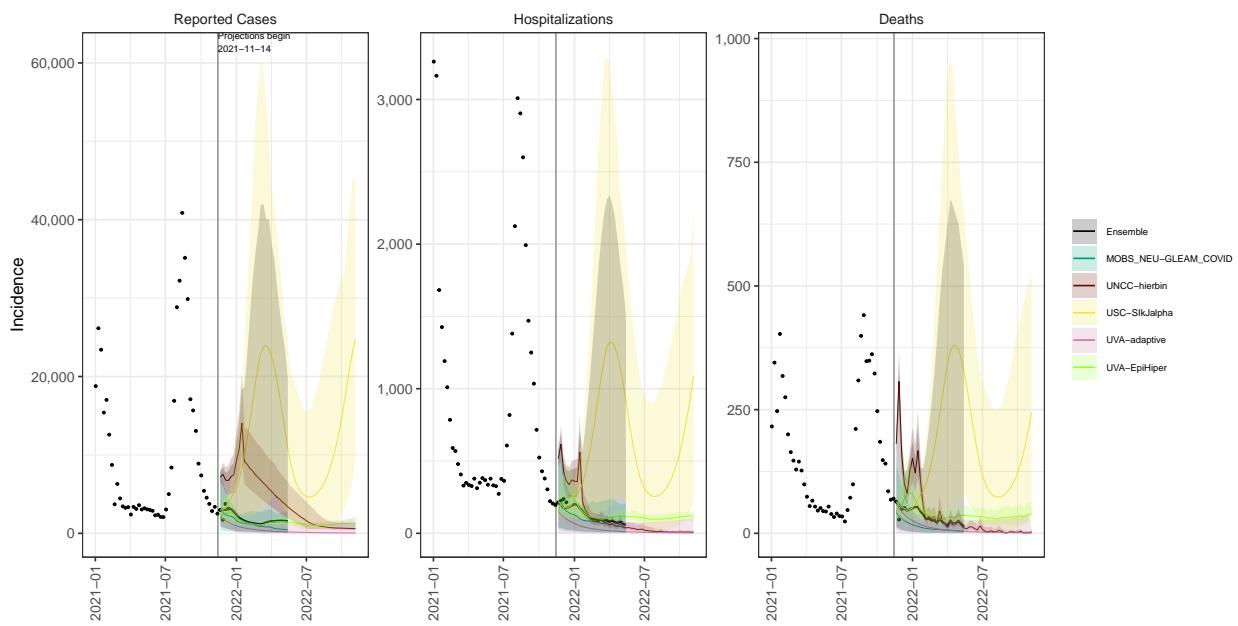
KS model variance & 95% projection intervals – Pessimistic waning, high booster coverage



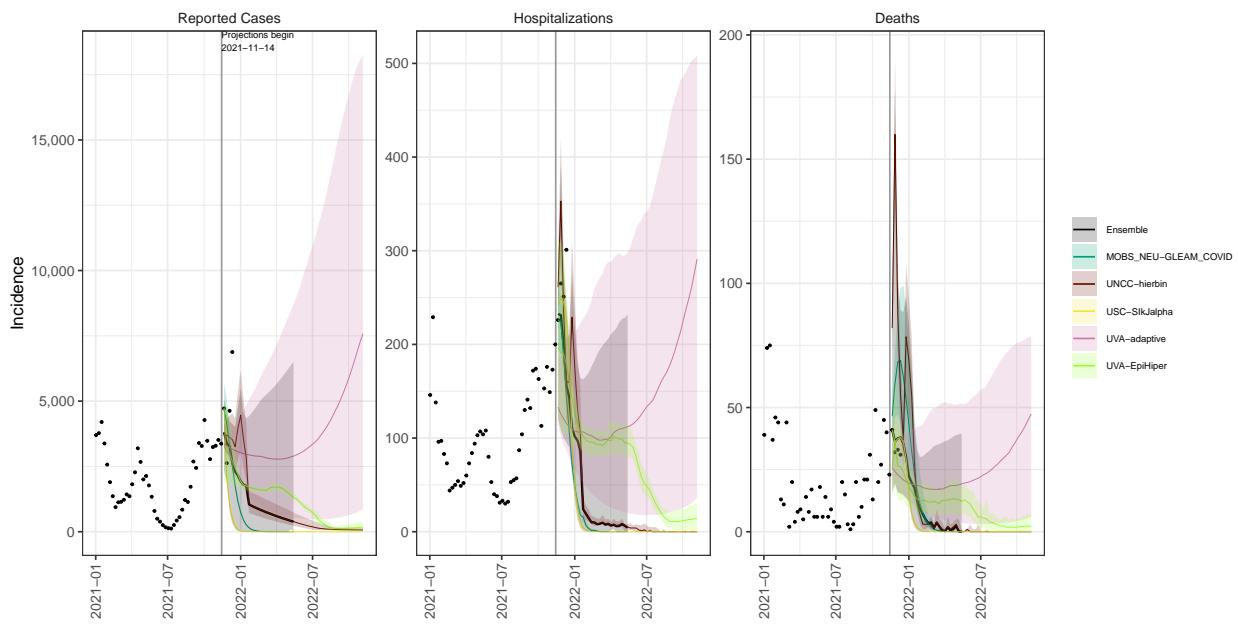
KY model variance & 95% projection intervals – Pessimistic waning, high booster coverage



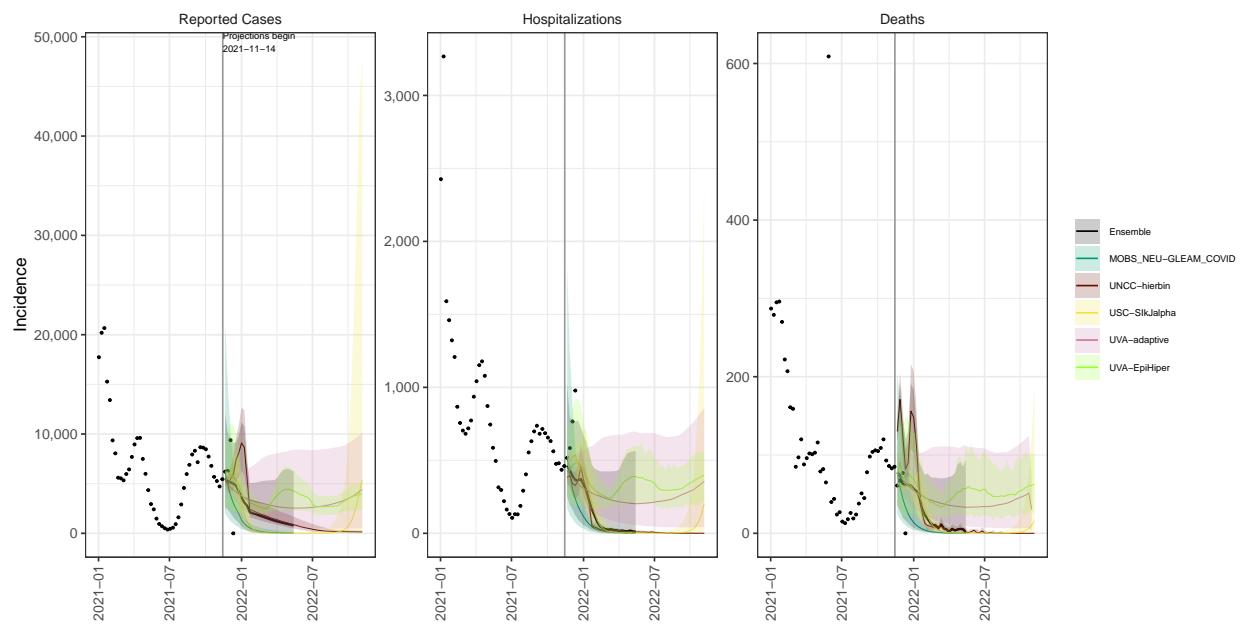
LA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



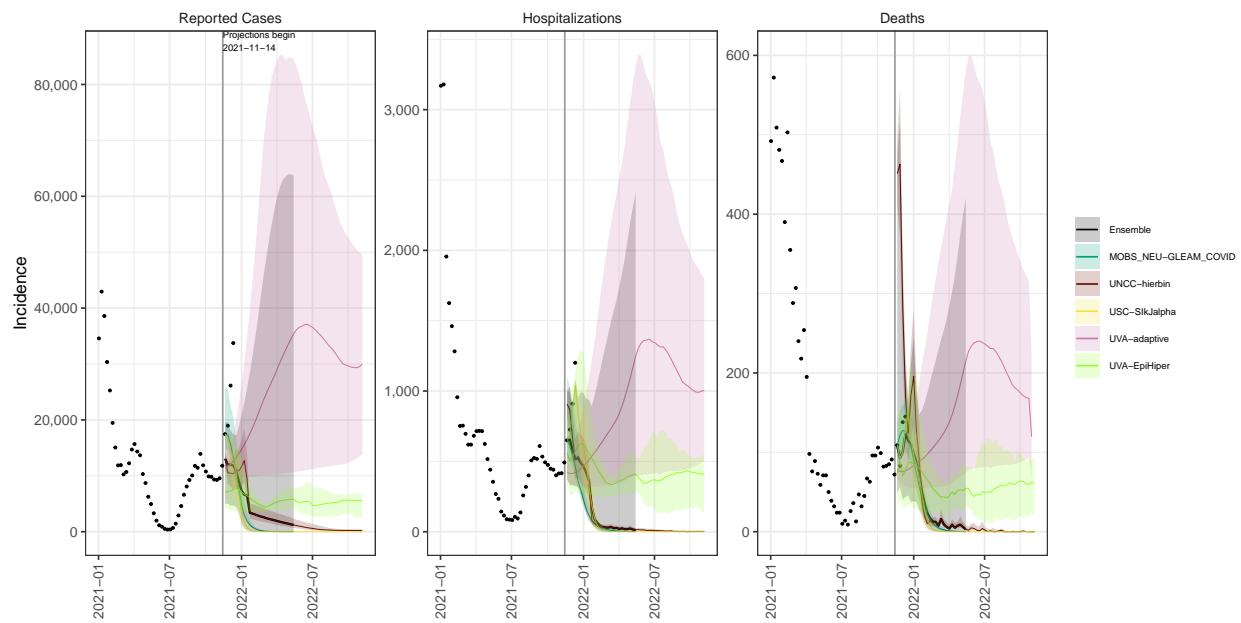
ME model variance & 95% projection intervals – Pessimistic waning, high booster coverage



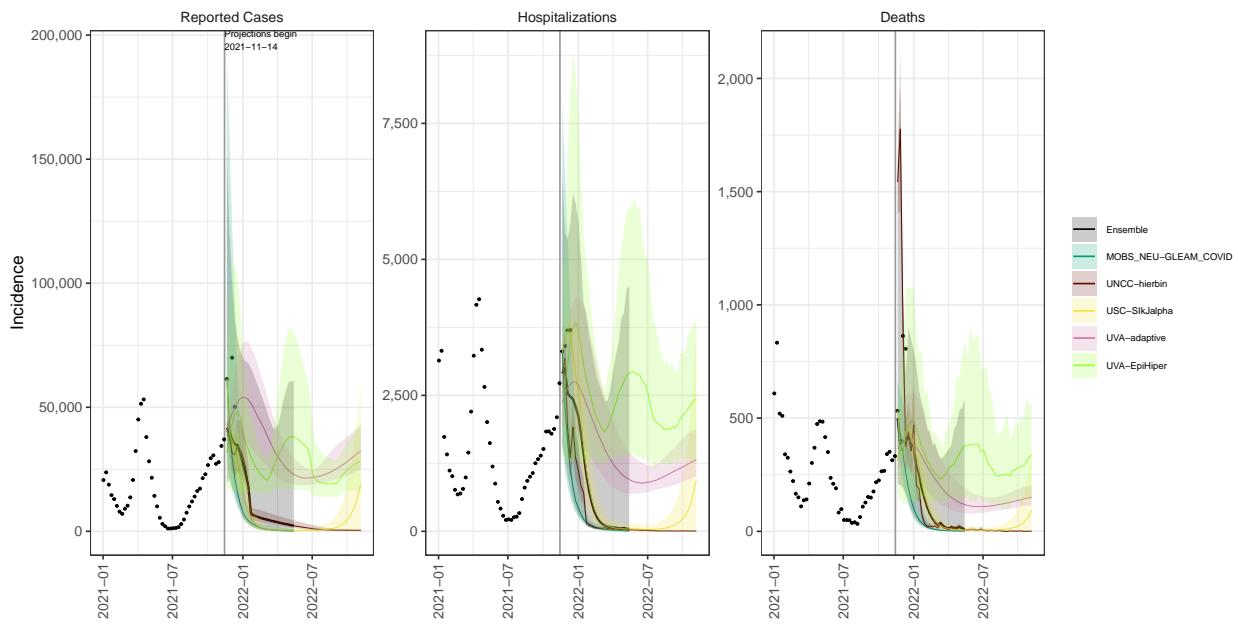
MD model variance & 95% projection intervals – Pessimistic waning, high booster coverage



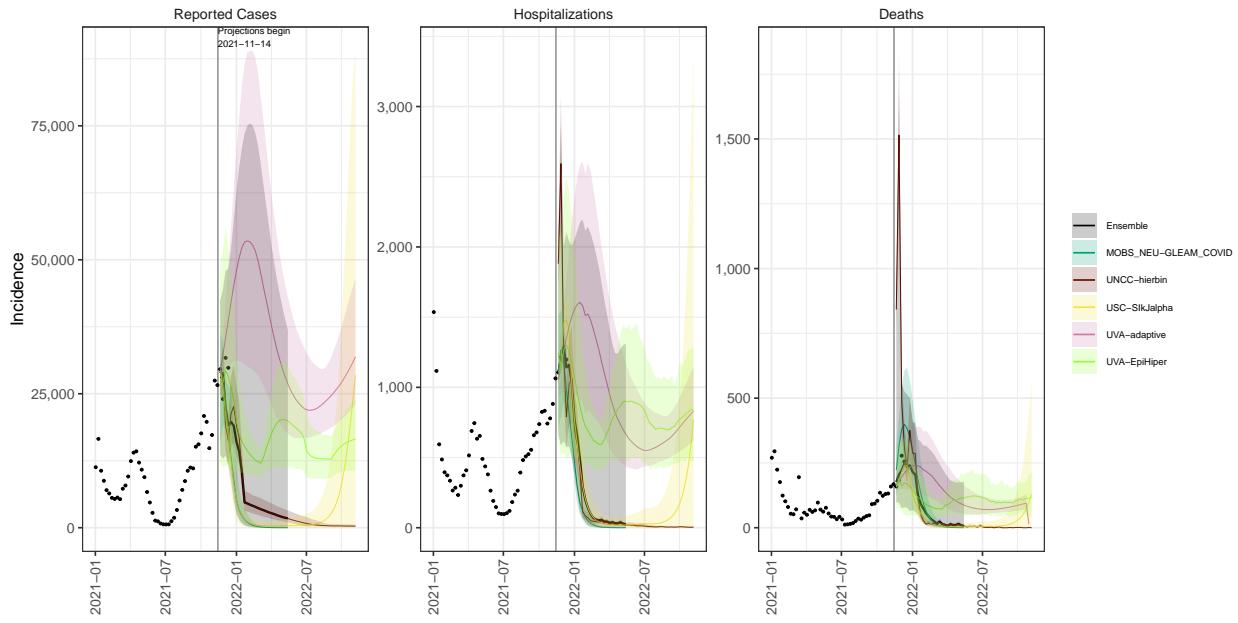
MA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



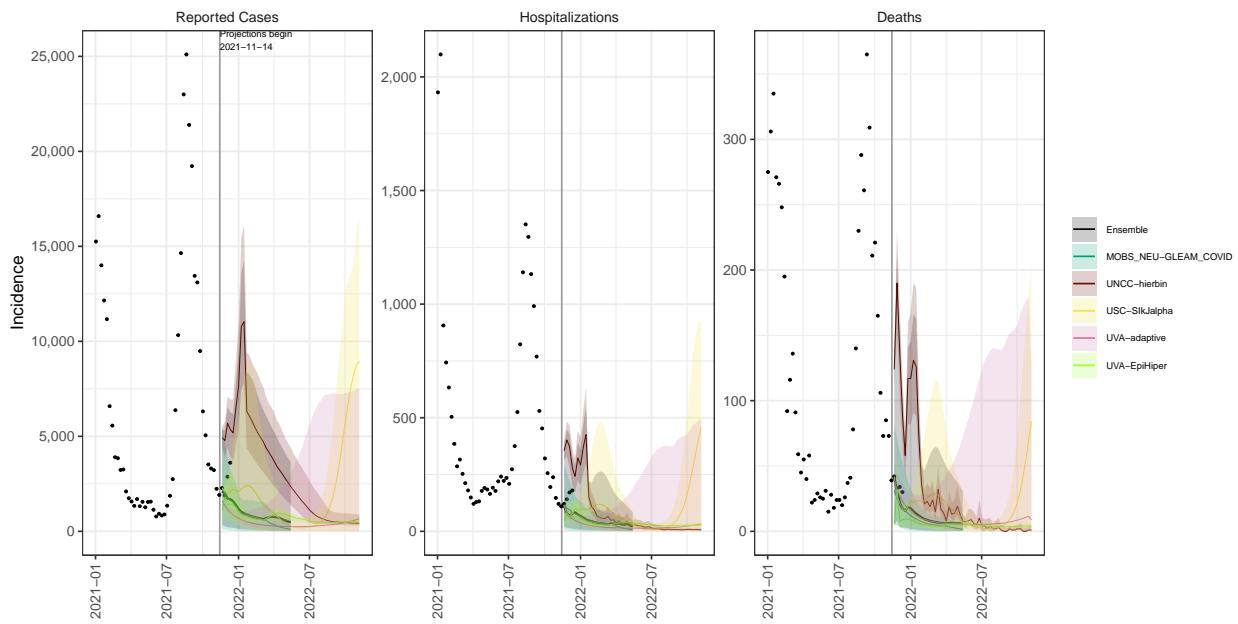
MI model variance & 95% projection intervals – Pessimistic waning, high booster coverage



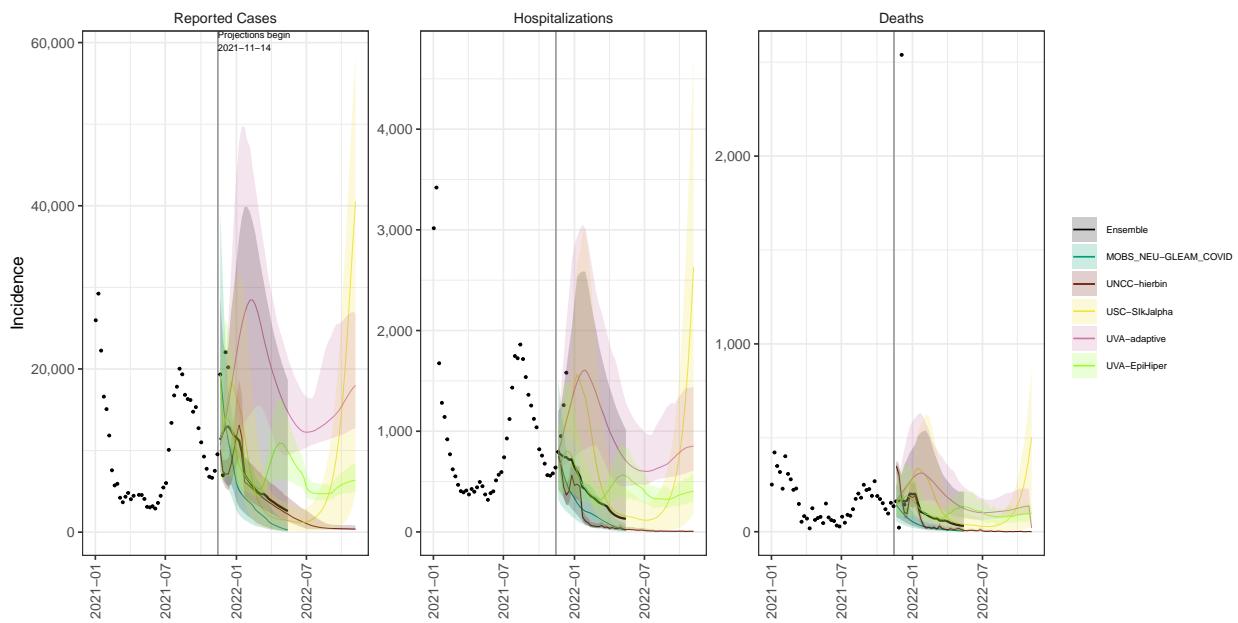
MN model variance & 95% projection intervals – Pessimistic waning, high booster coverage



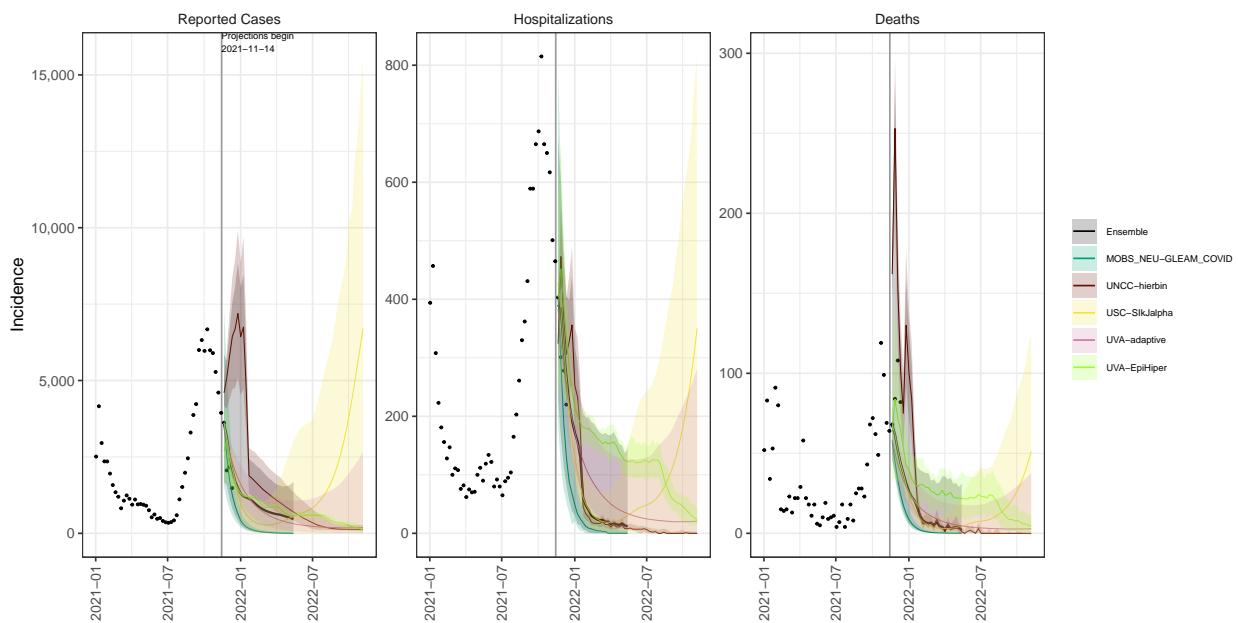
MS model variance & 95% projection intervals – Pessimistic waning, high booster coverage



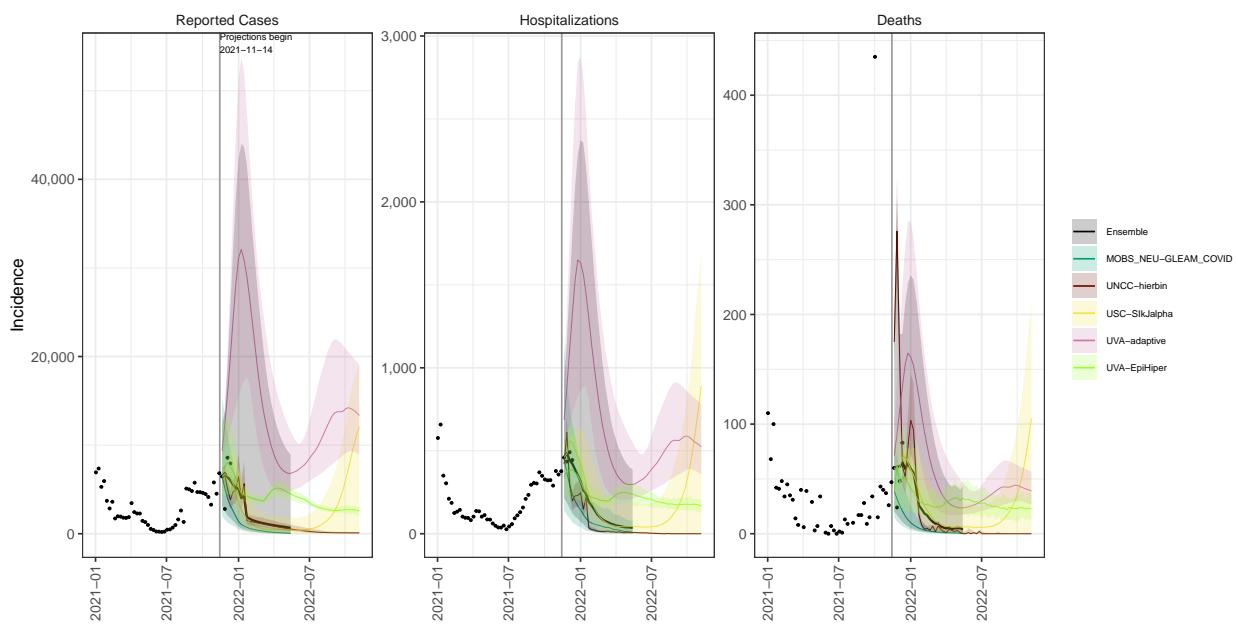
MO model variance & 95% projection intervals – Pessimistic waning, high booster coverage



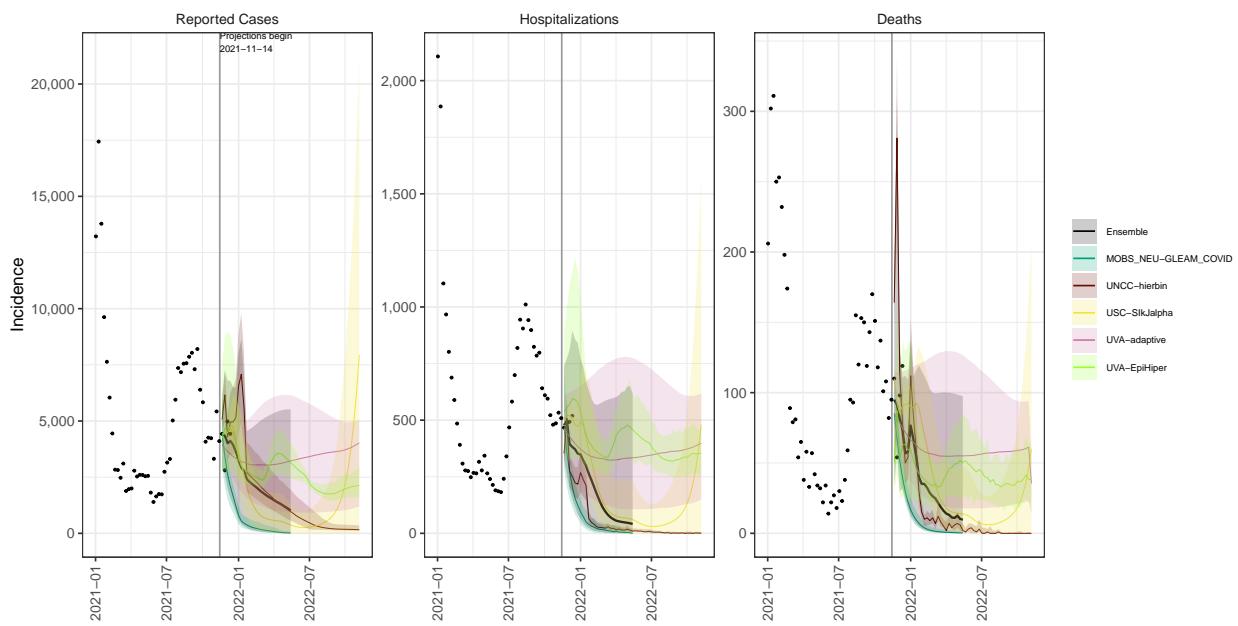
MT model variance & 95% projection intervals – Pessimistic waning, high booster coverage



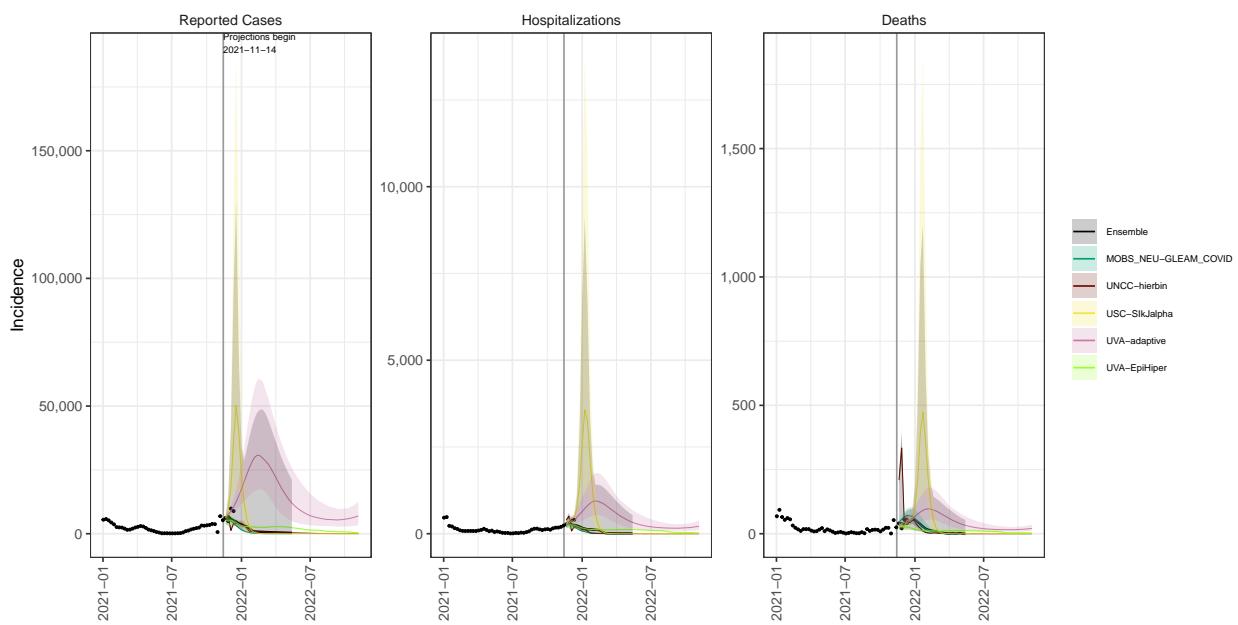
NE model variance & 95% projection intervals – Pessimistic waning, high booster coverage



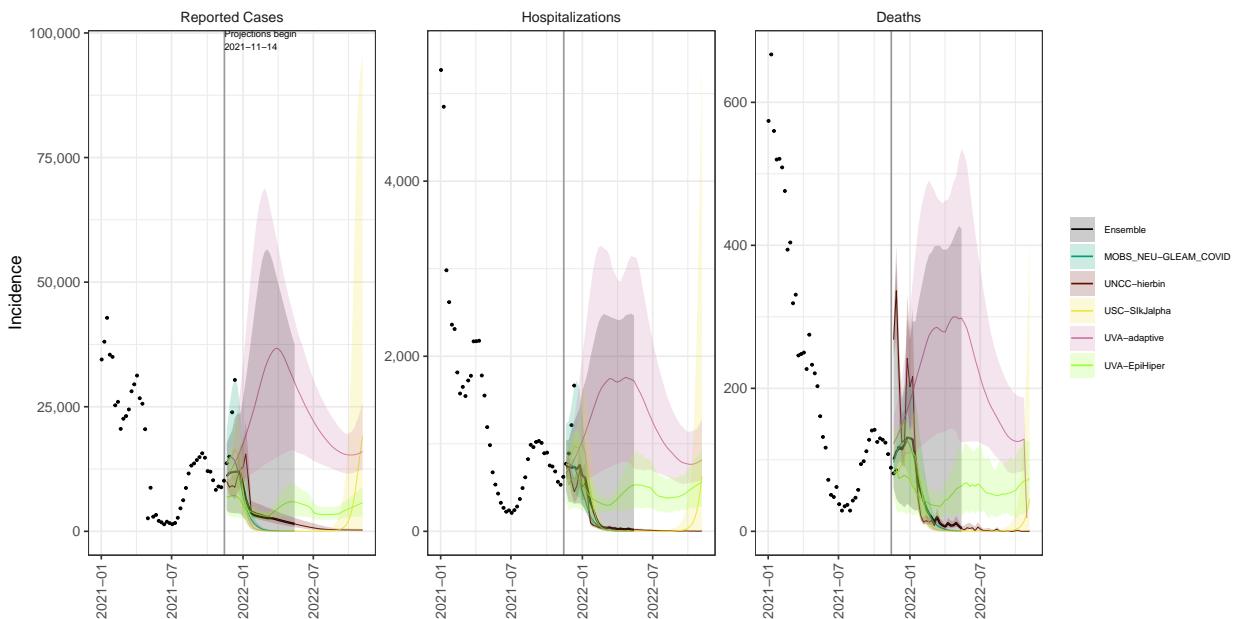
NV model variance & 95% projection intervals – Pessimistic waning, high booster coverage



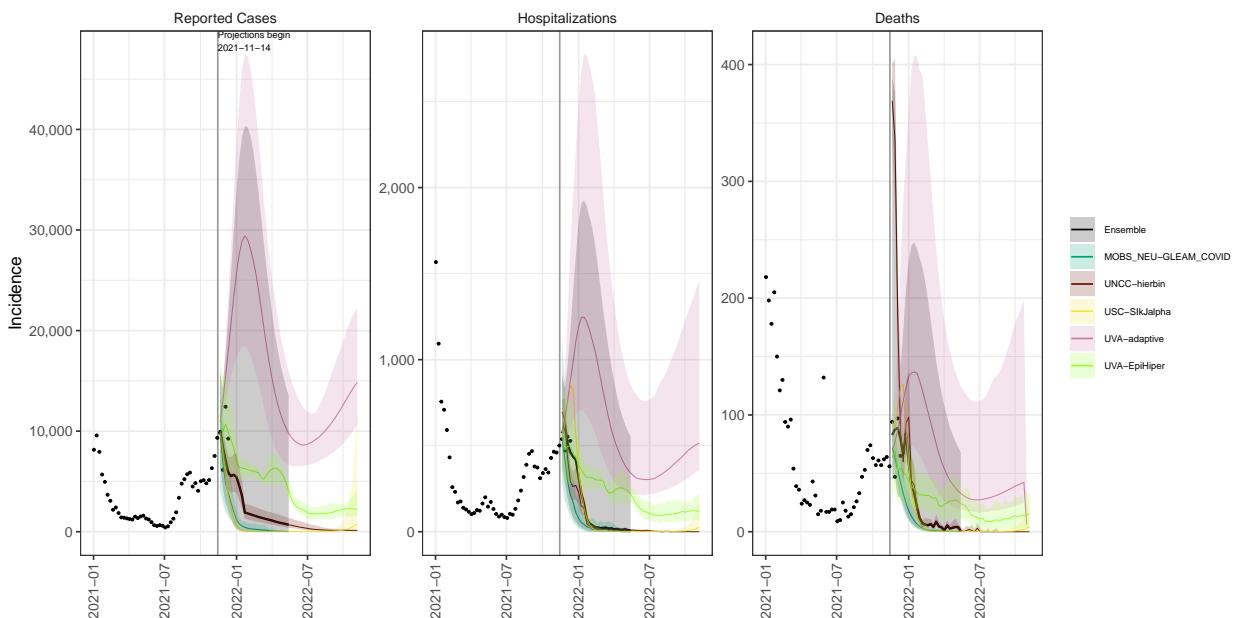
NH model variance & 95% projection intervals – Pessimistic waning, high booster coverage



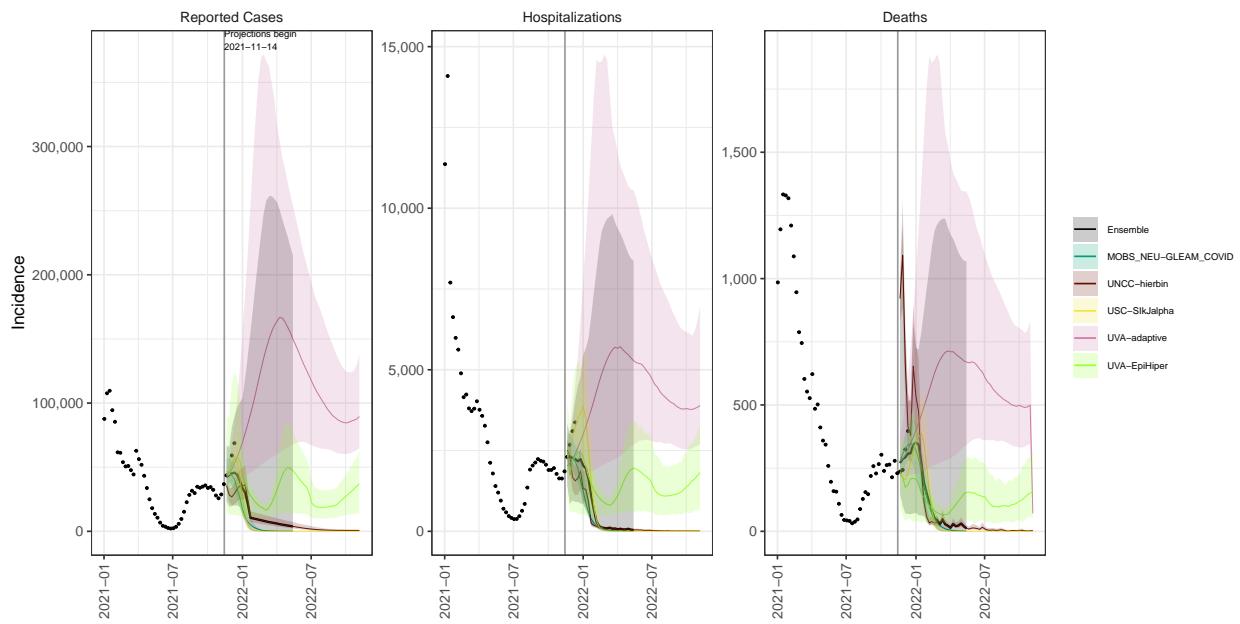
### NJ model variance & 95% projection intervals – Pessimistic waning, high booster coverage



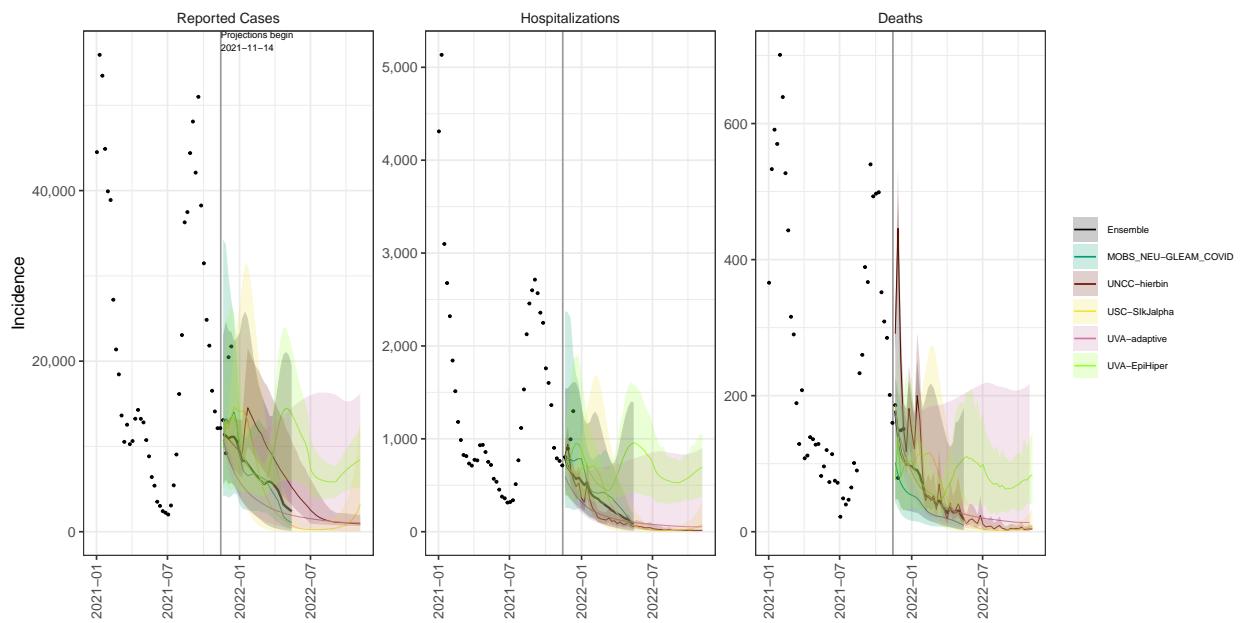
### NM model variance & 95% projection intervals – Pessimistic waning, high booster coverage



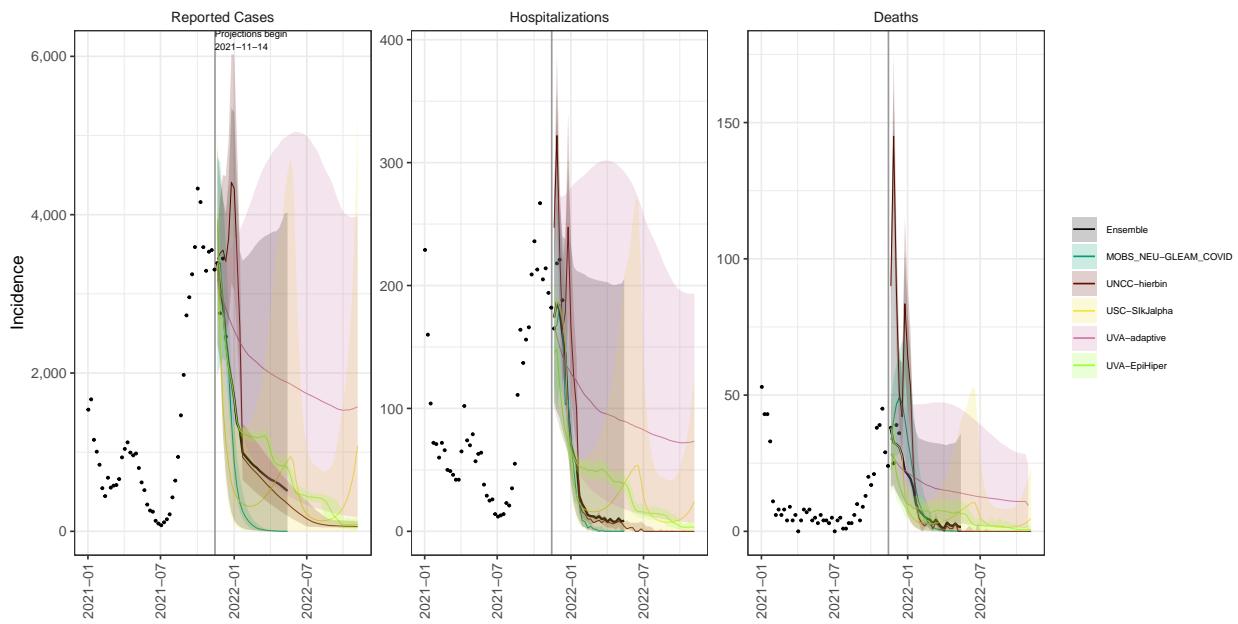
NY model variance & 95% projection intervals – Pessimistic waning, high booster coverage



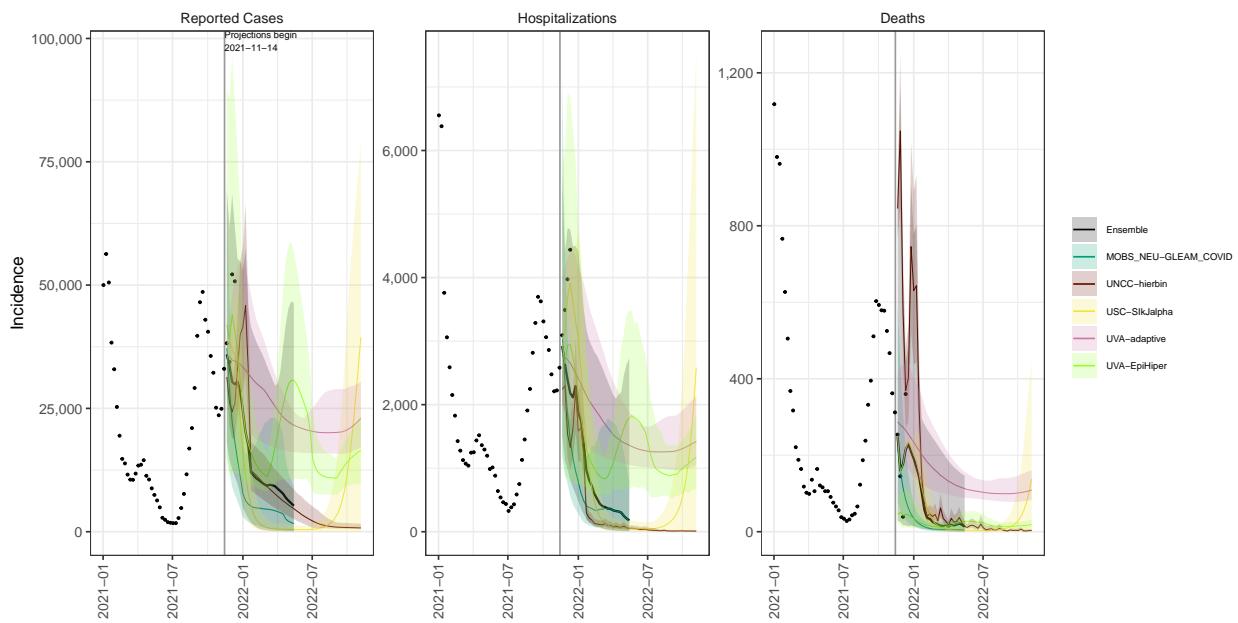
NC model variance & 95% projection intervals – Pessimistic waning, high booster coverage



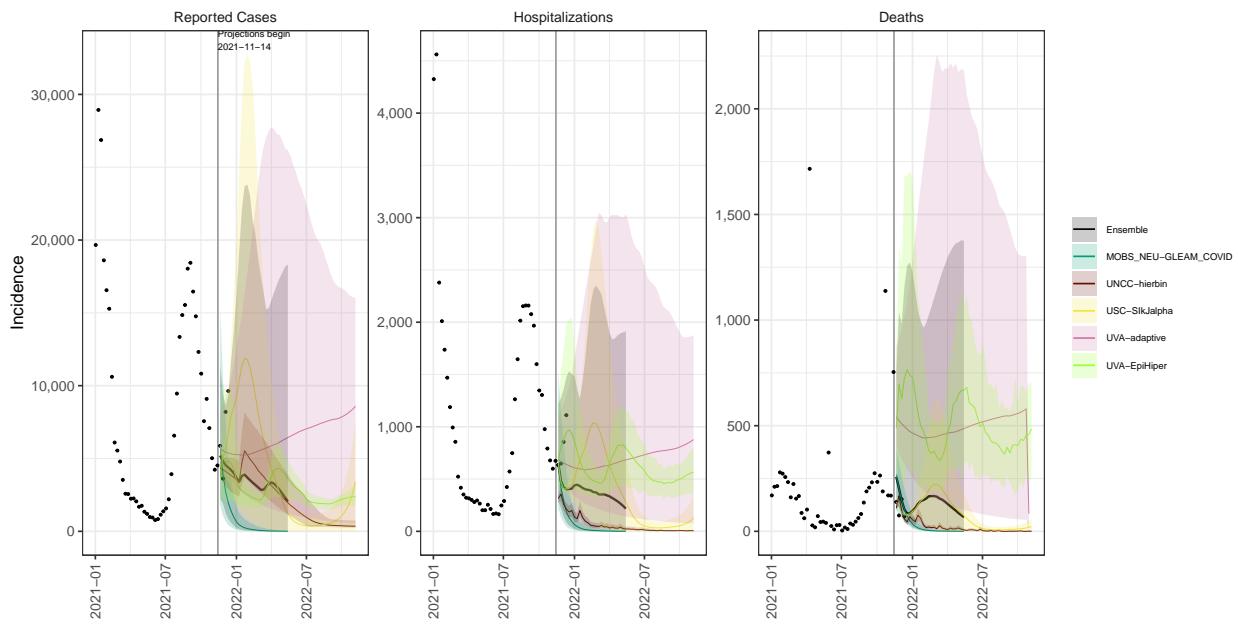
ND model variance & 95% projection intervals – Pessimistic waning, high booster coverage



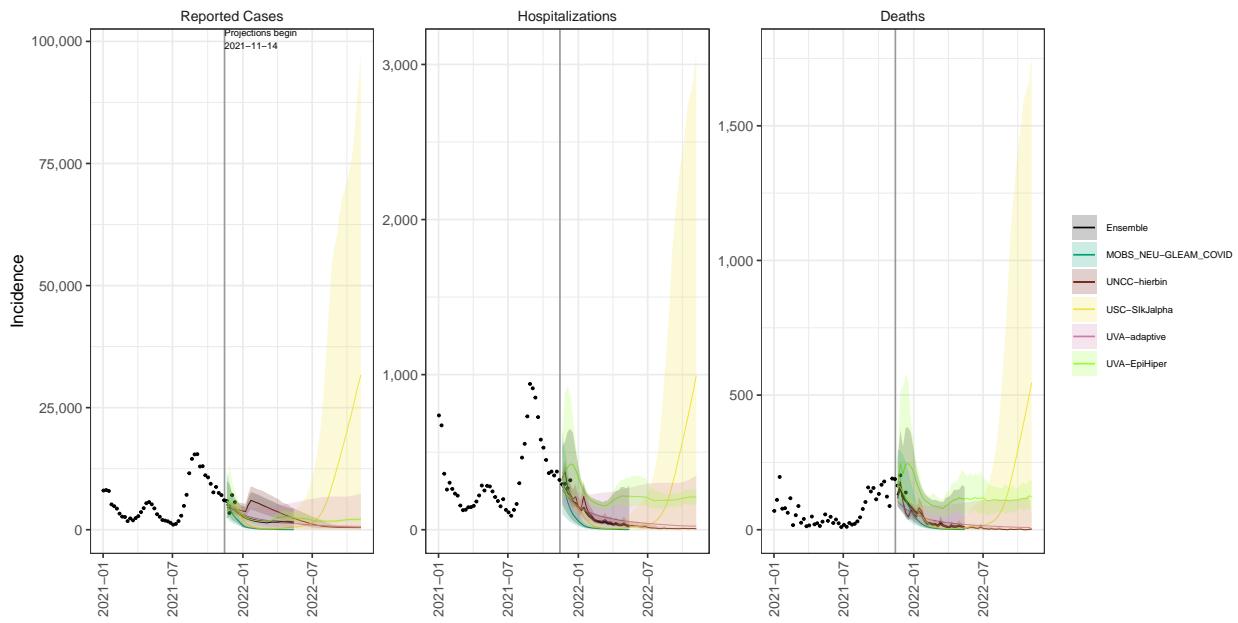
OH model variance & 95% projection intervals – Pessimistic waning, high booster coverage



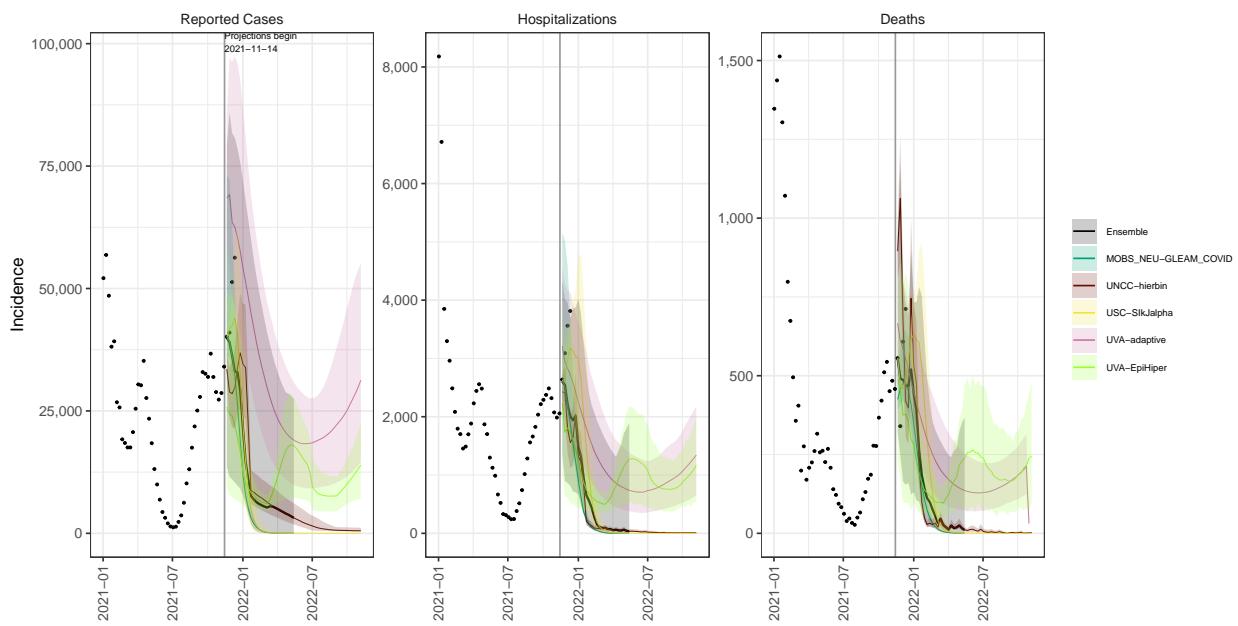
OK model variance & 95% projection intervals – Pessimistic waning, high booster coverage



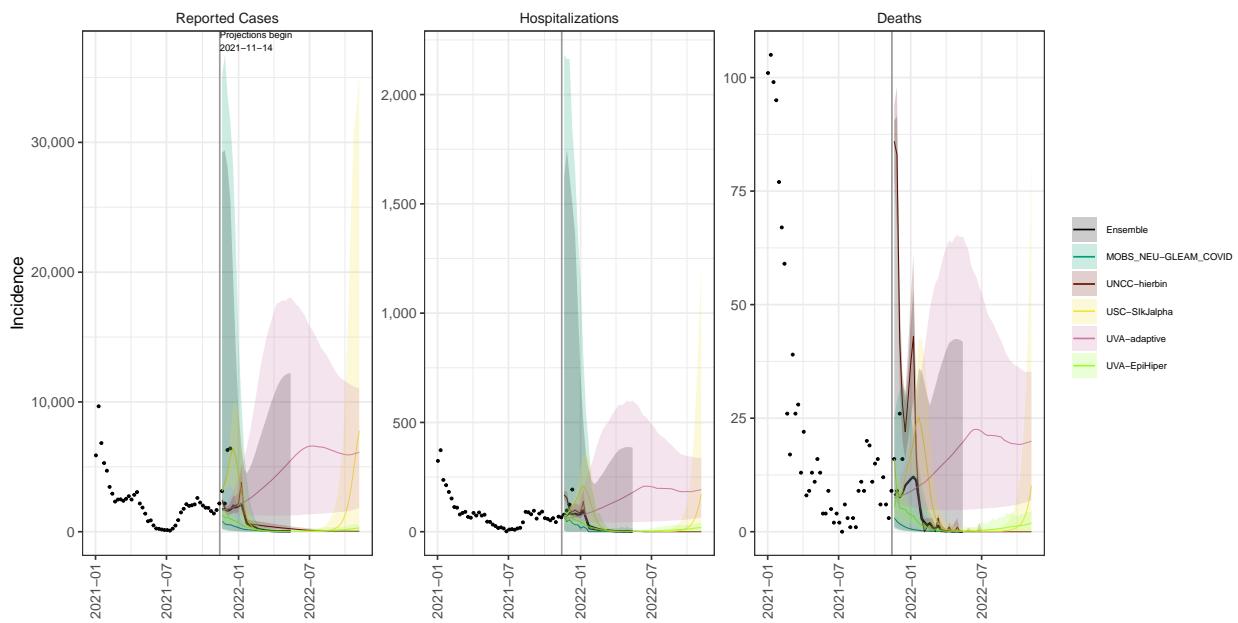
OR model variance & 95% projection intervals – Pessimistic waning, high booster coverage



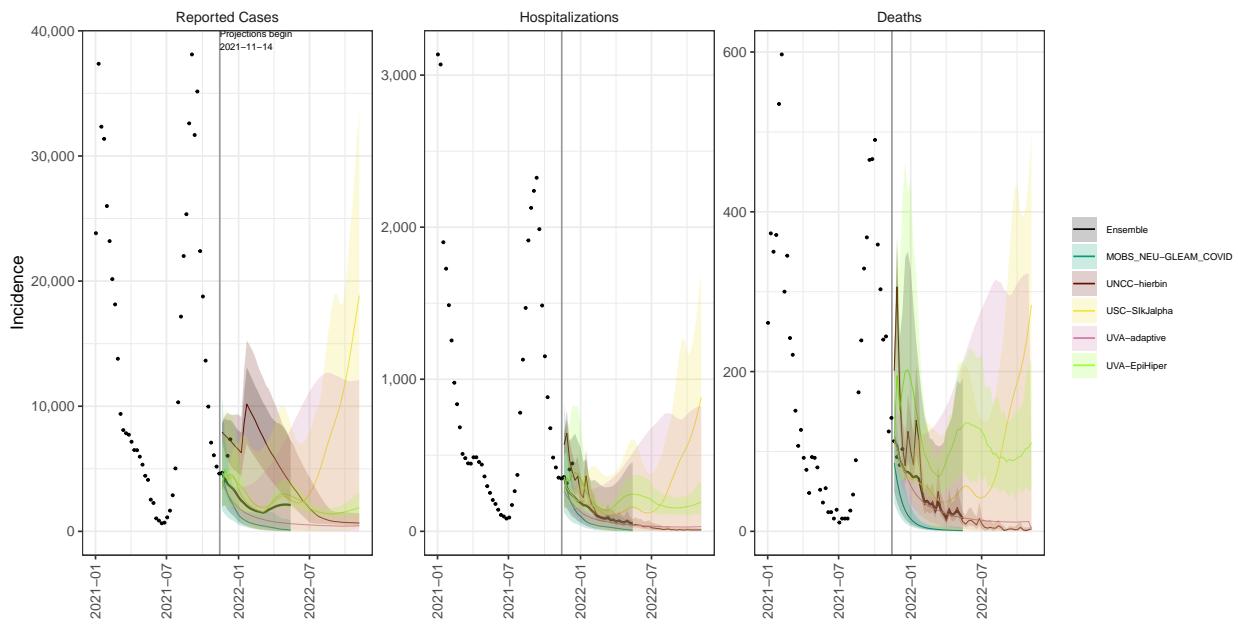
PA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



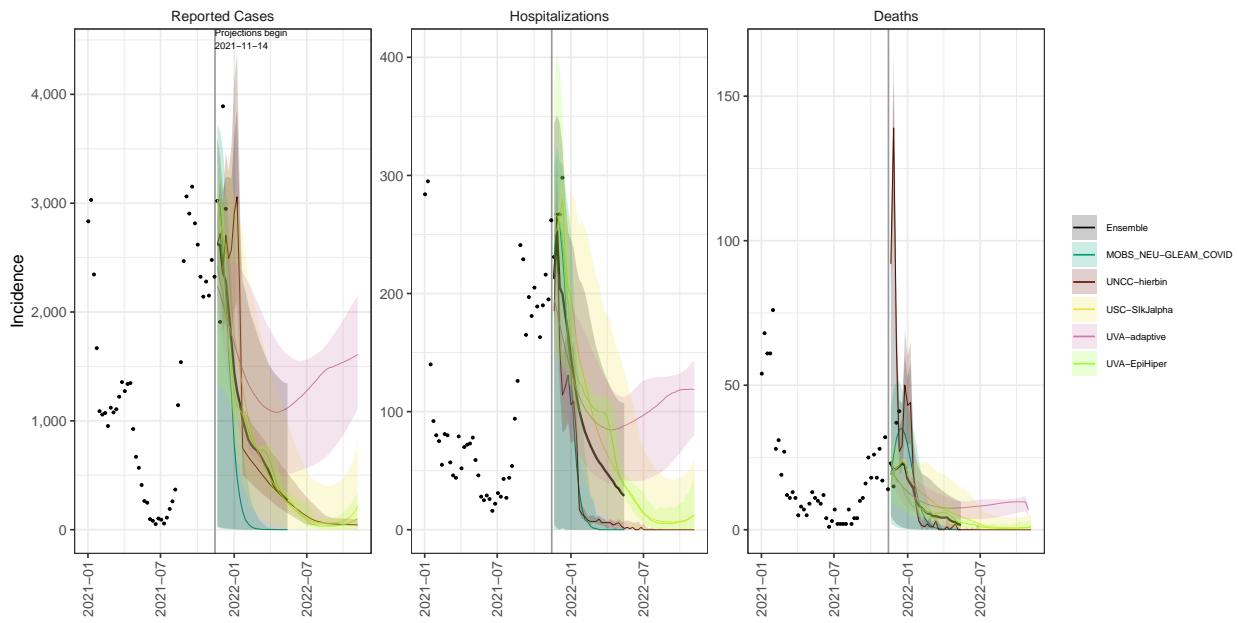
RI model variance & 95% projection intervals – Pessimistic waning, high booster coverage



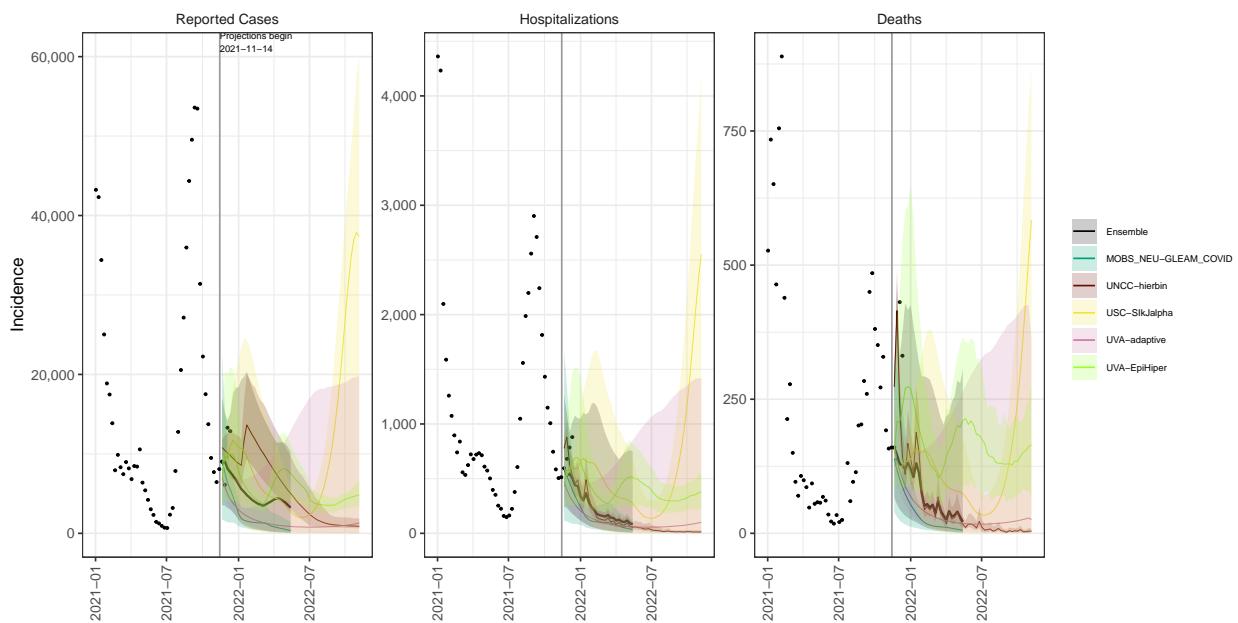
SC model variance & 95% projection intervals – Pessimistic waning, high booster coverage



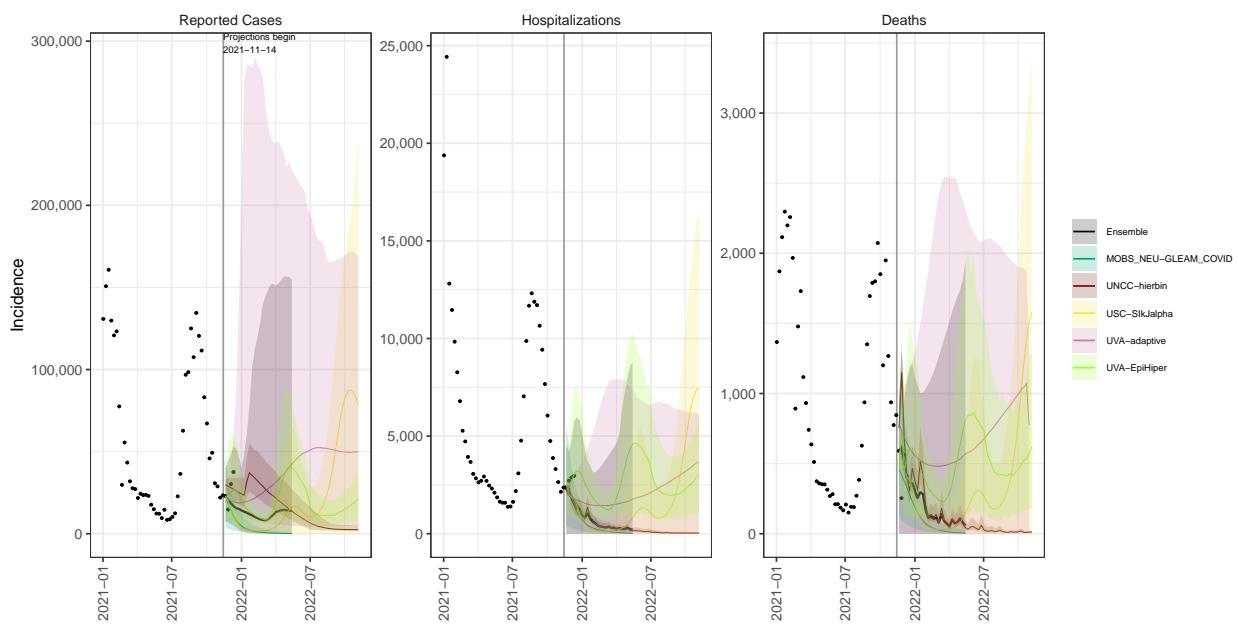
SD model variance & 95% projection intervals – Pessimistic waning, high booster coverage



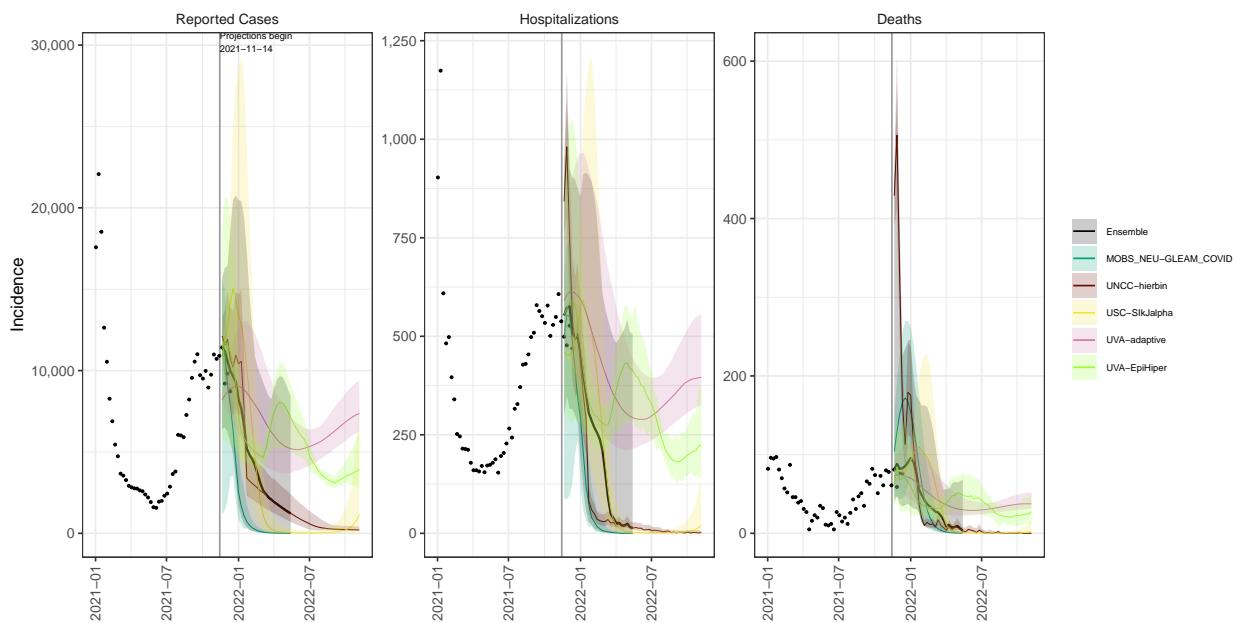
TN model variance & 95% projection intervals – Pessimistic waning, high booster coverage



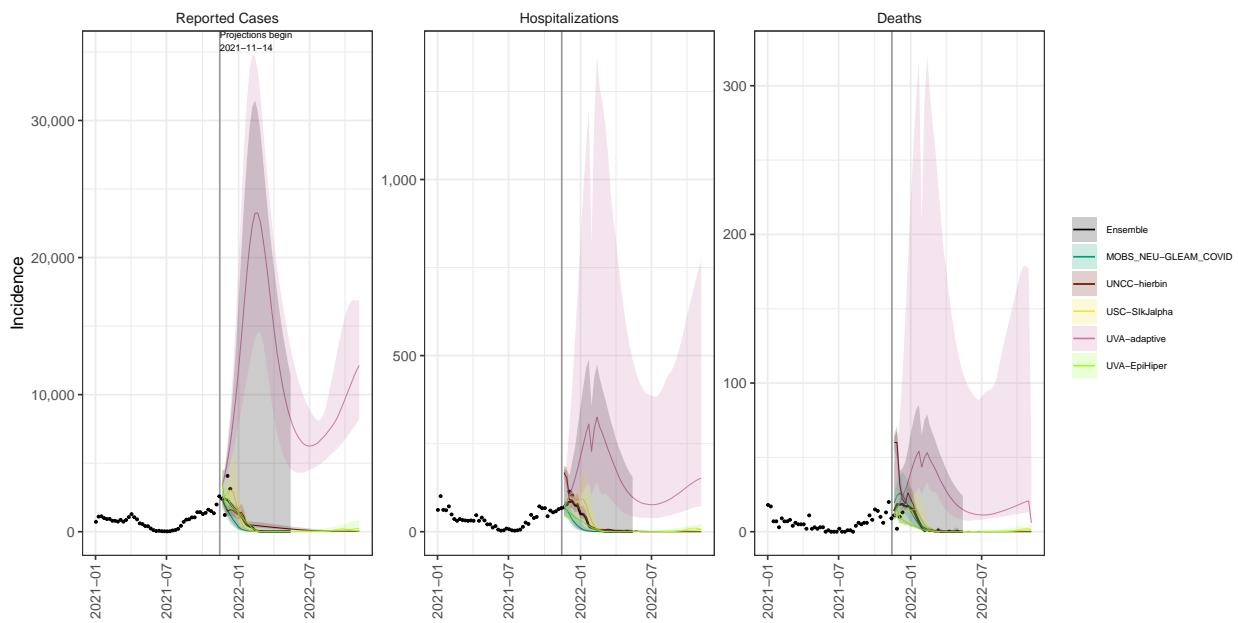
TX model variance & 95% projection intervals – Pessimistic waning, high booster coverage



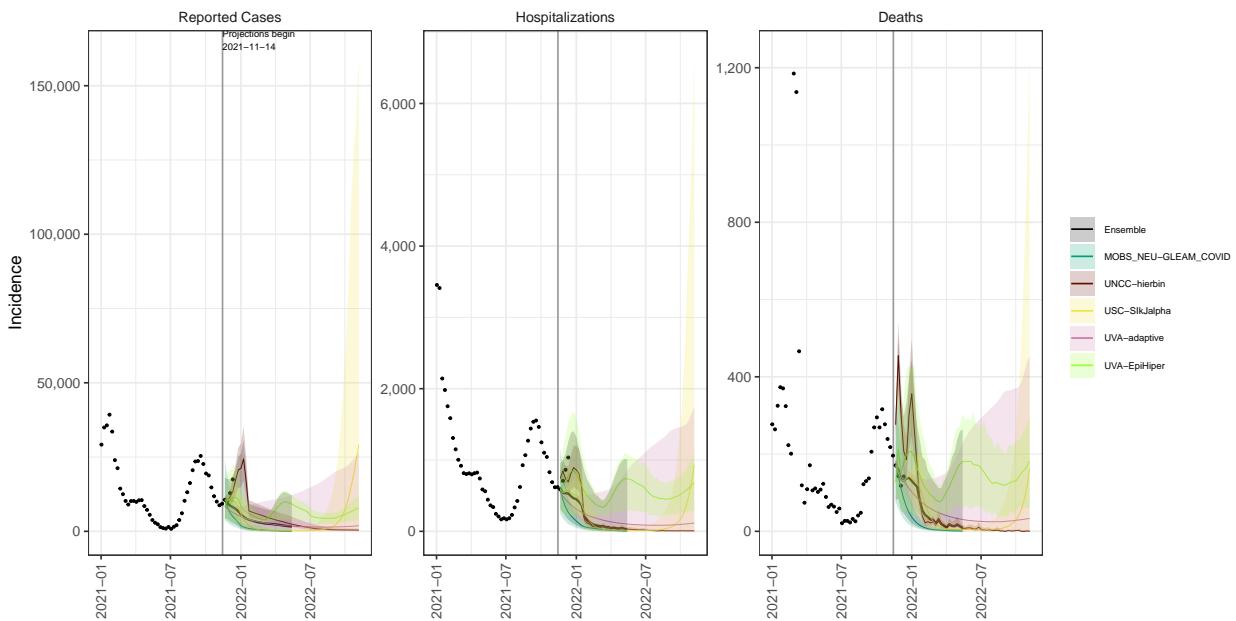
UT model variance & 95% projection intervals – Pessimistic waning, high booster coverage



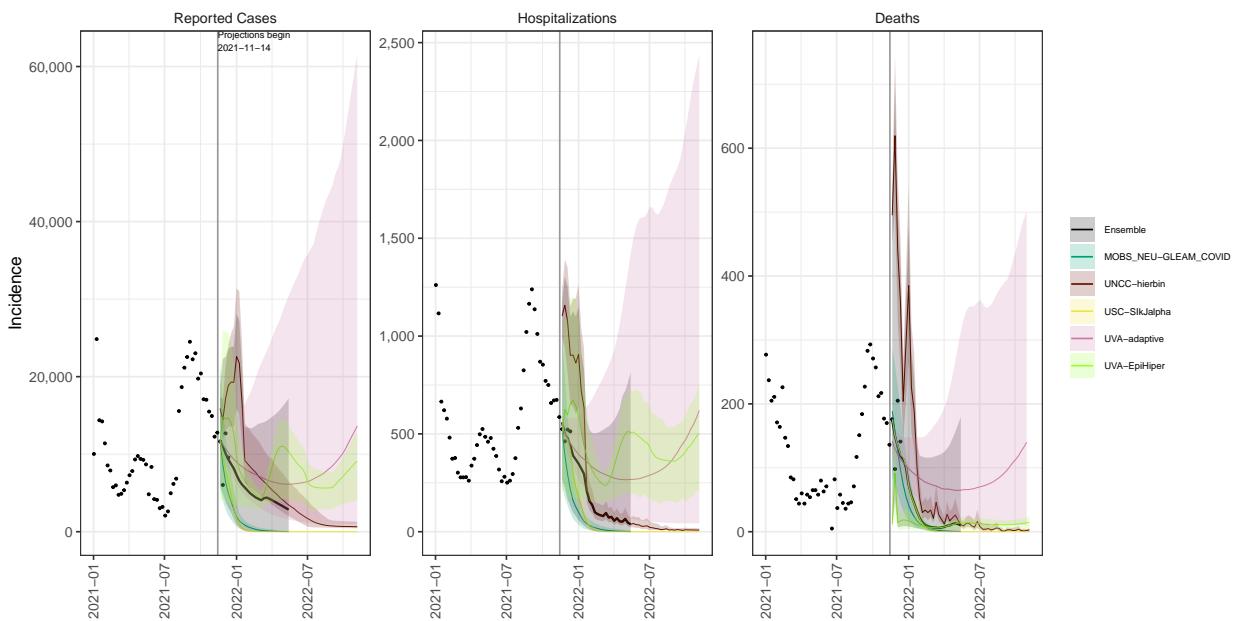
VT model variance & 95% projection intervals – Pessimistic waning, high booster coverage



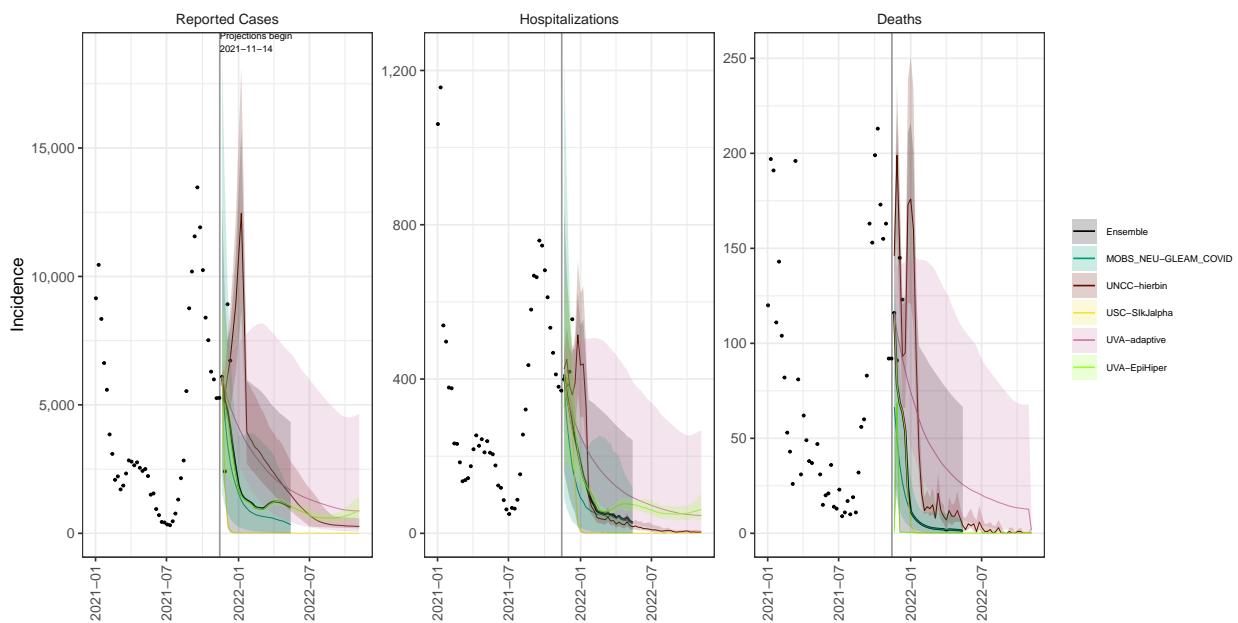
VA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



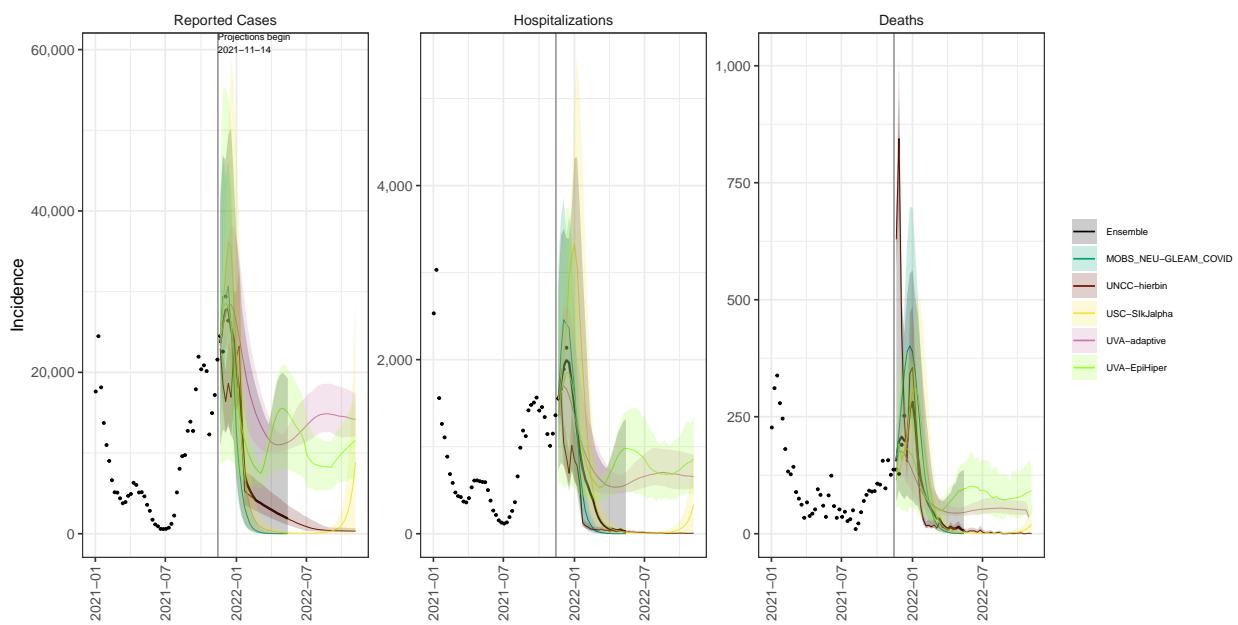
WA model variance & 95% projection intervals – Pessimistic waning, high booster coverage



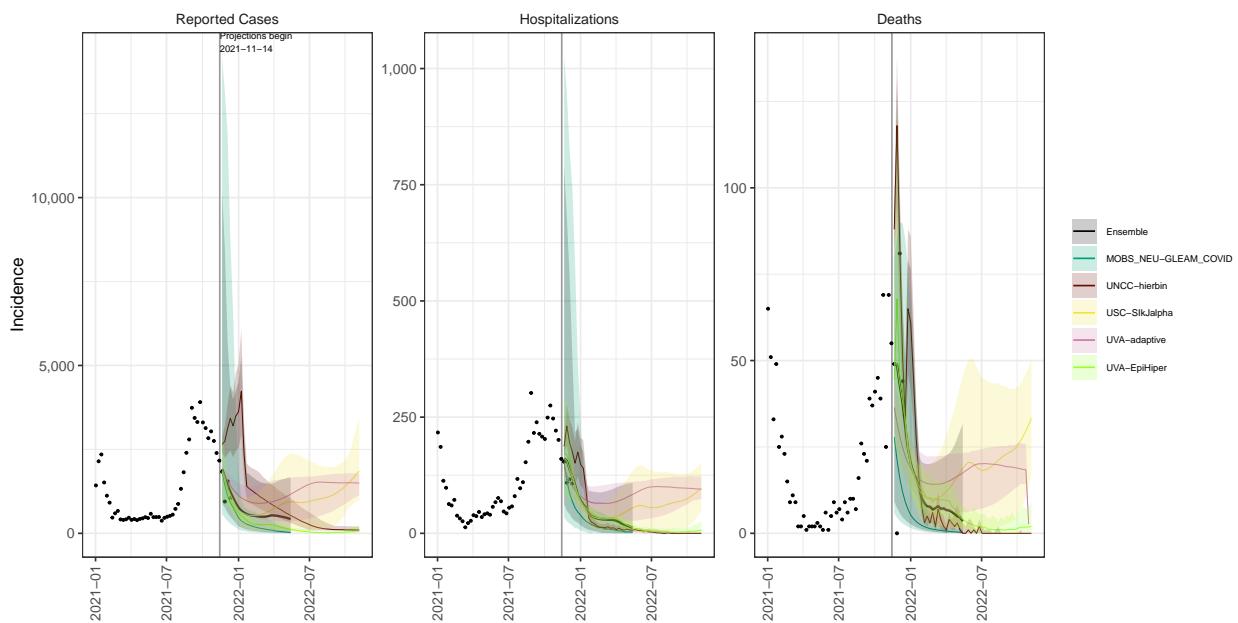
WV model variance & 95% projection intervals – Pessimistic waning, high booster coverage



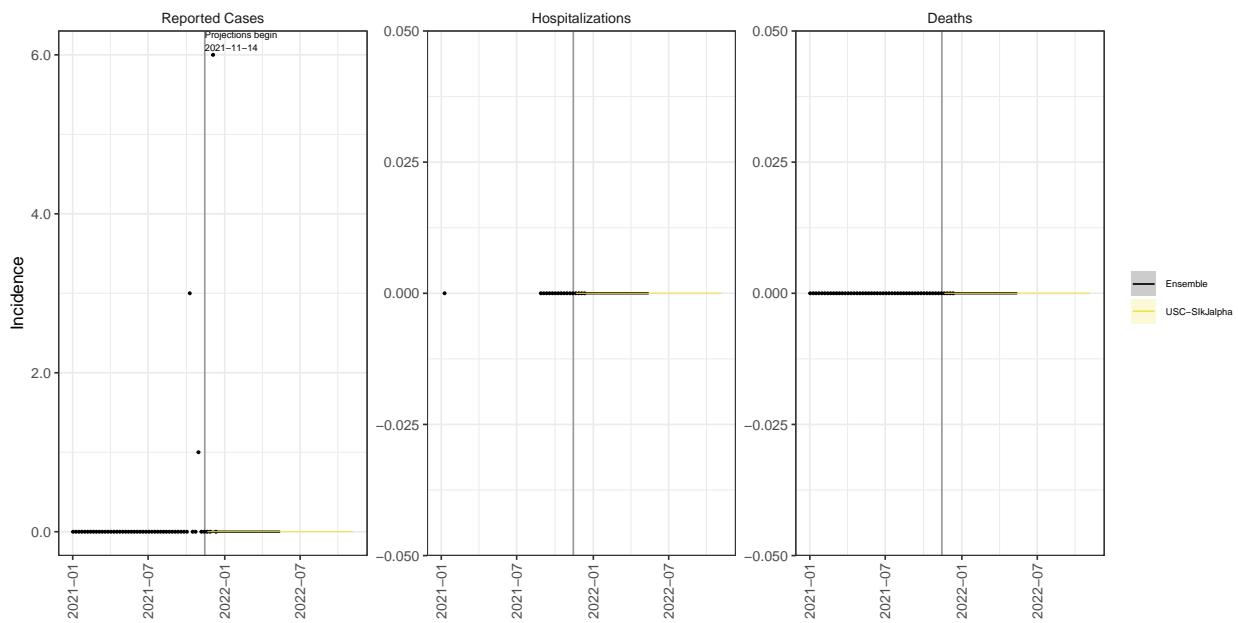
WI model variance & 95% projection intervals – Pessimistic waning, high booster coverage



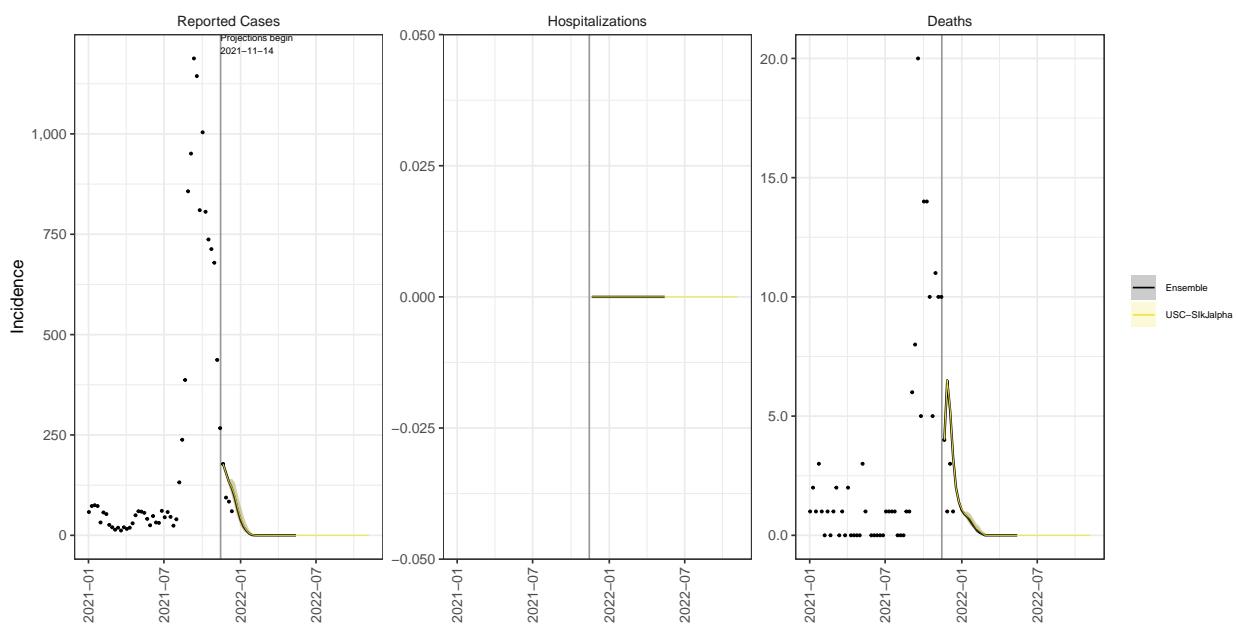
WY model variance & 95% projection intervals – Pessimistic waning, high booster coverage



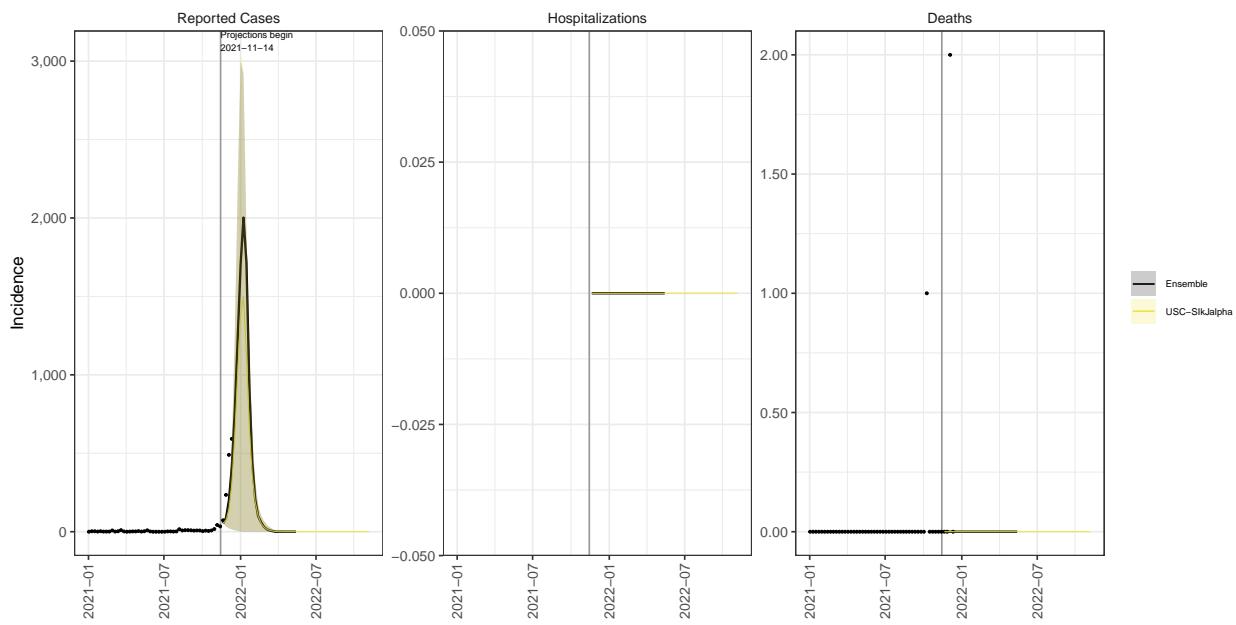
AS model variance & 95% projection intervals – Pessimistic waning, high booster coverage



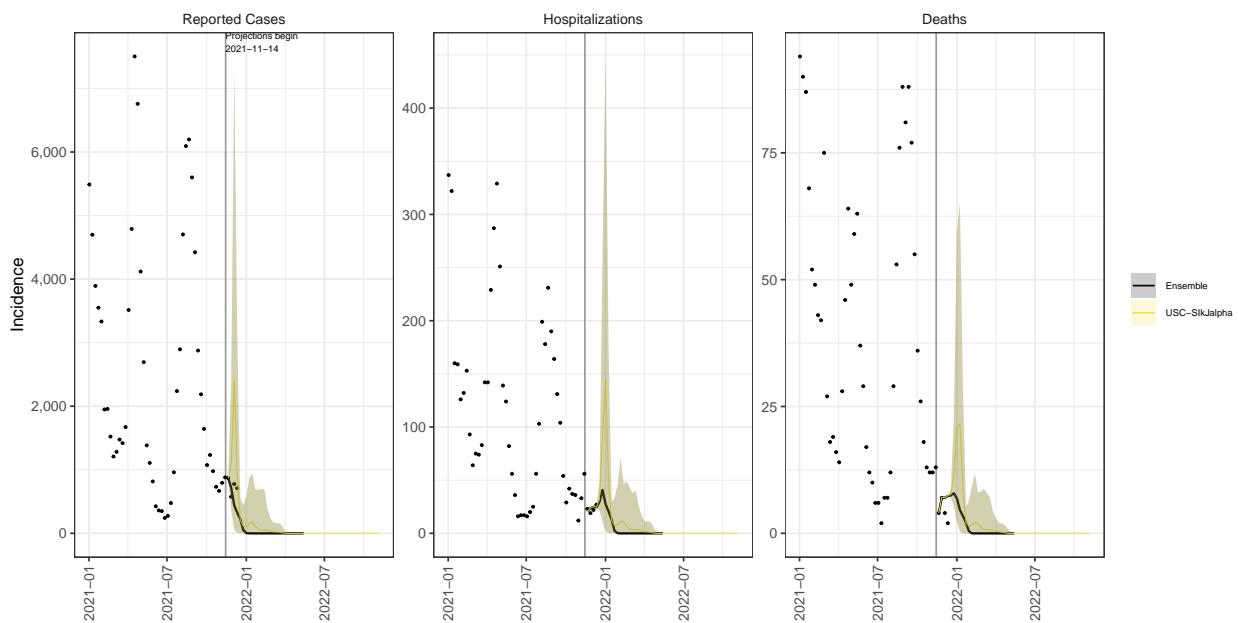
GU model variance & 95% projection intervals – Pessimistic waning, high booster coverage



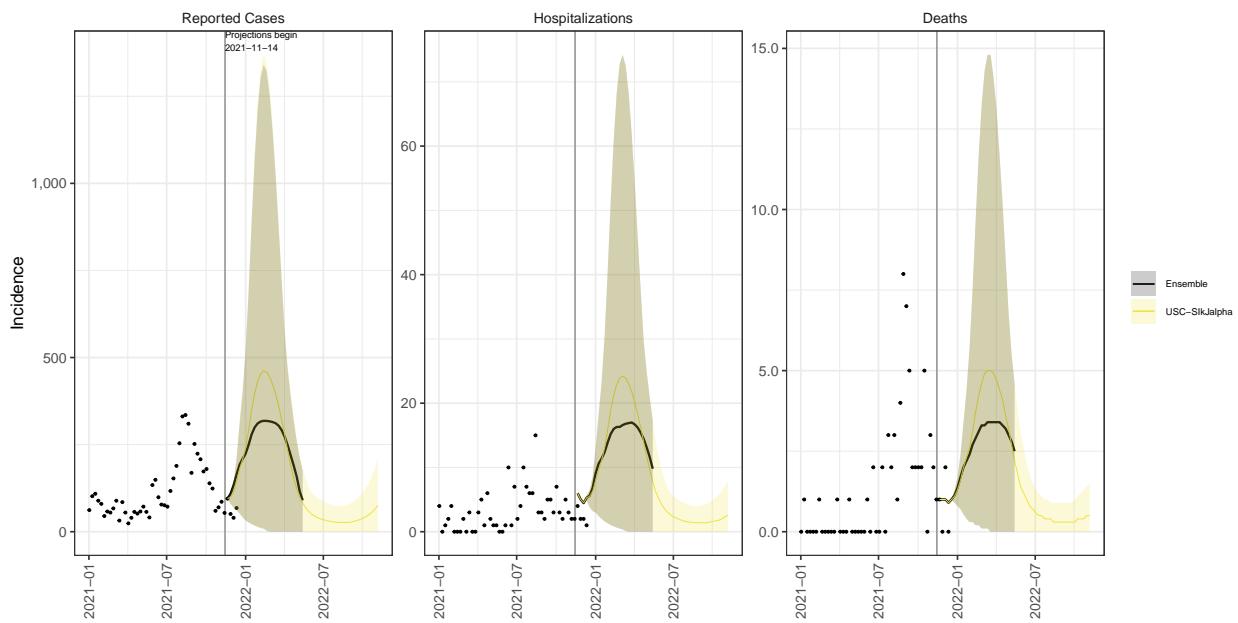
MP model variance & 95% projection intervals – Pessimistic waning, high booster coverage



PR model variance & 95% projection intervals – Pessimistic waning, high booster coverage

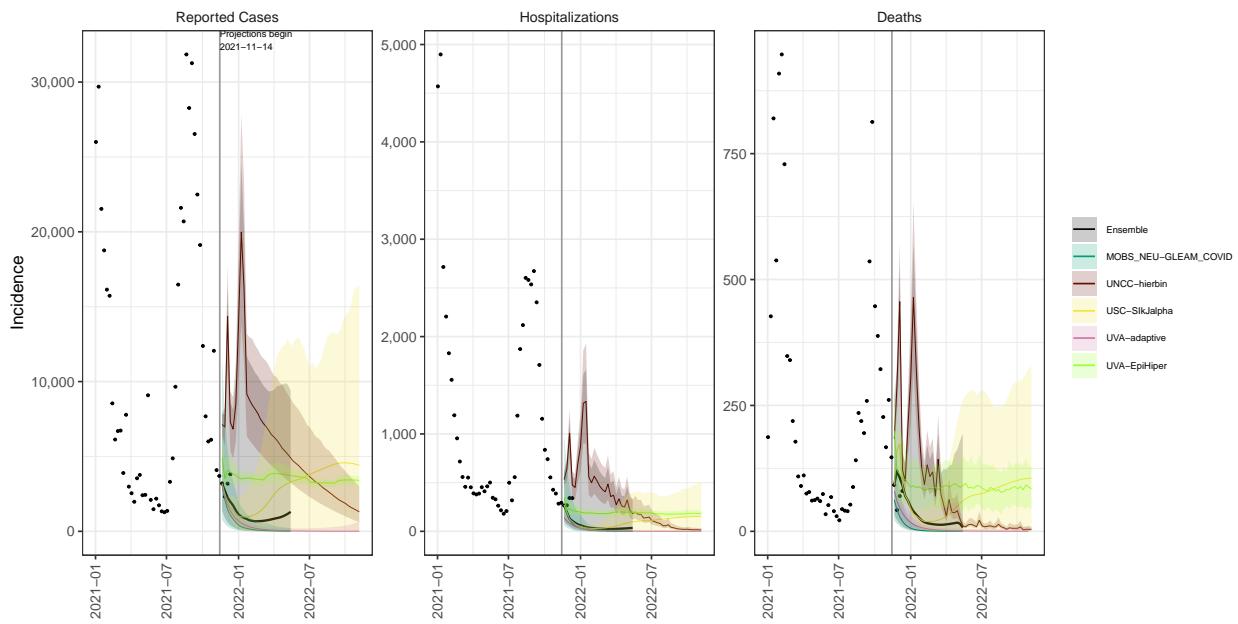


VI model variance & 95% projection intervals – Pessimistic waning, high booster coverage

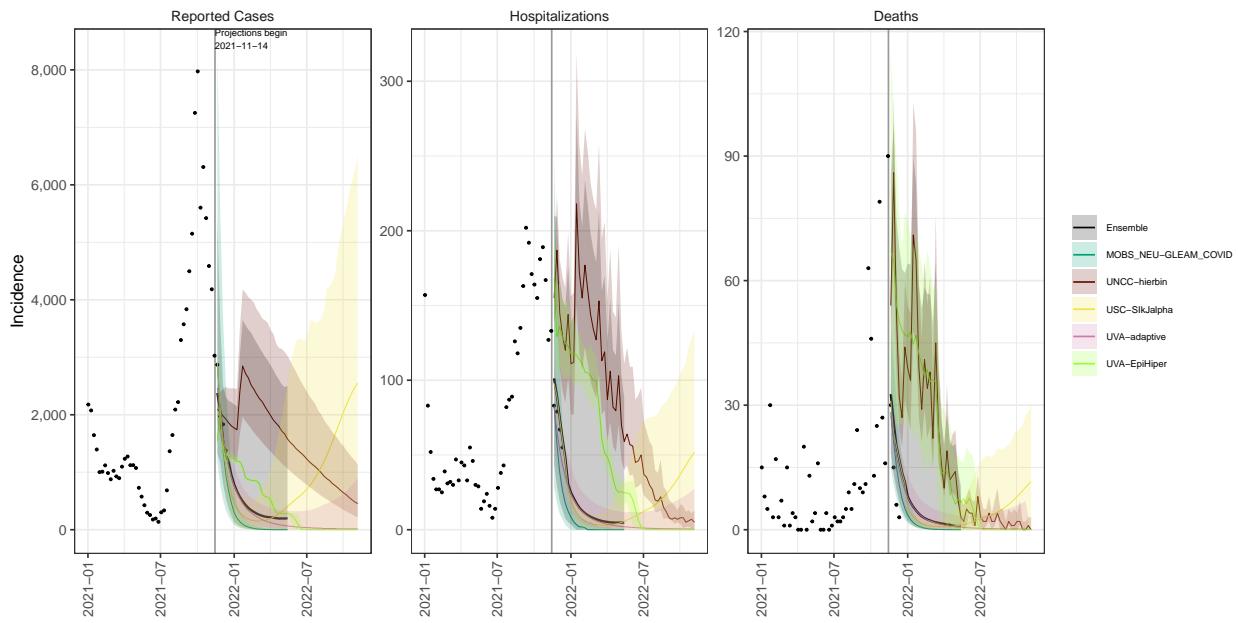


National model variation for the optimistic waning, low booster coverage scenario

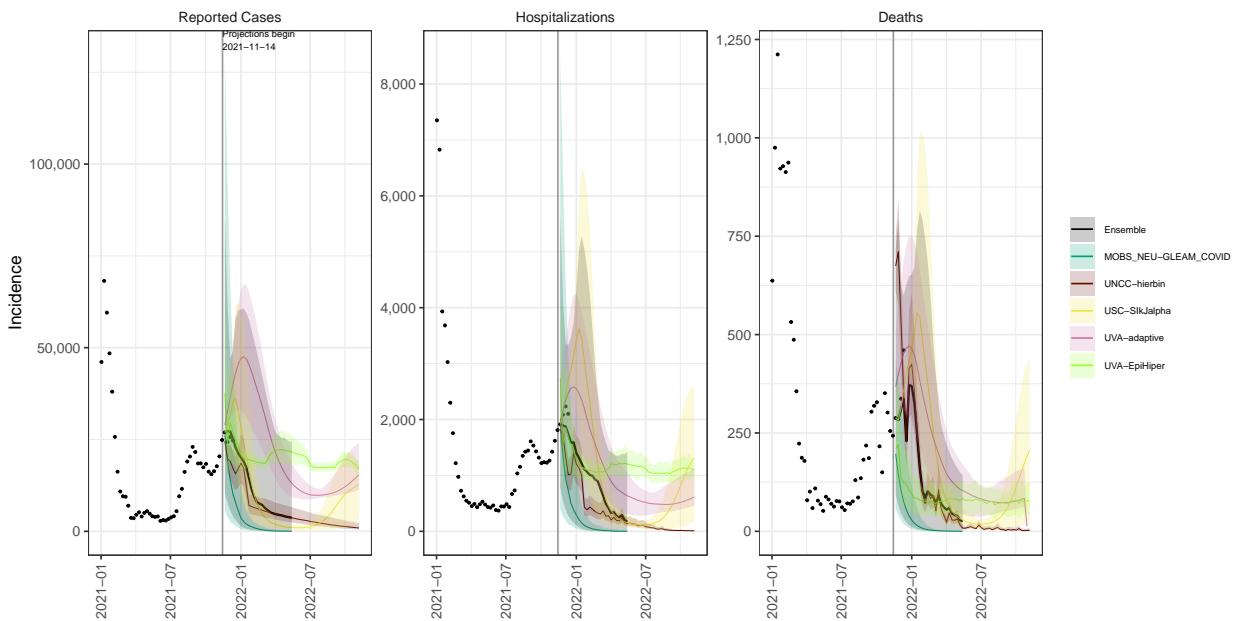
AL model variance & 95% projection intervals – Optimistic waning, low booster coverage



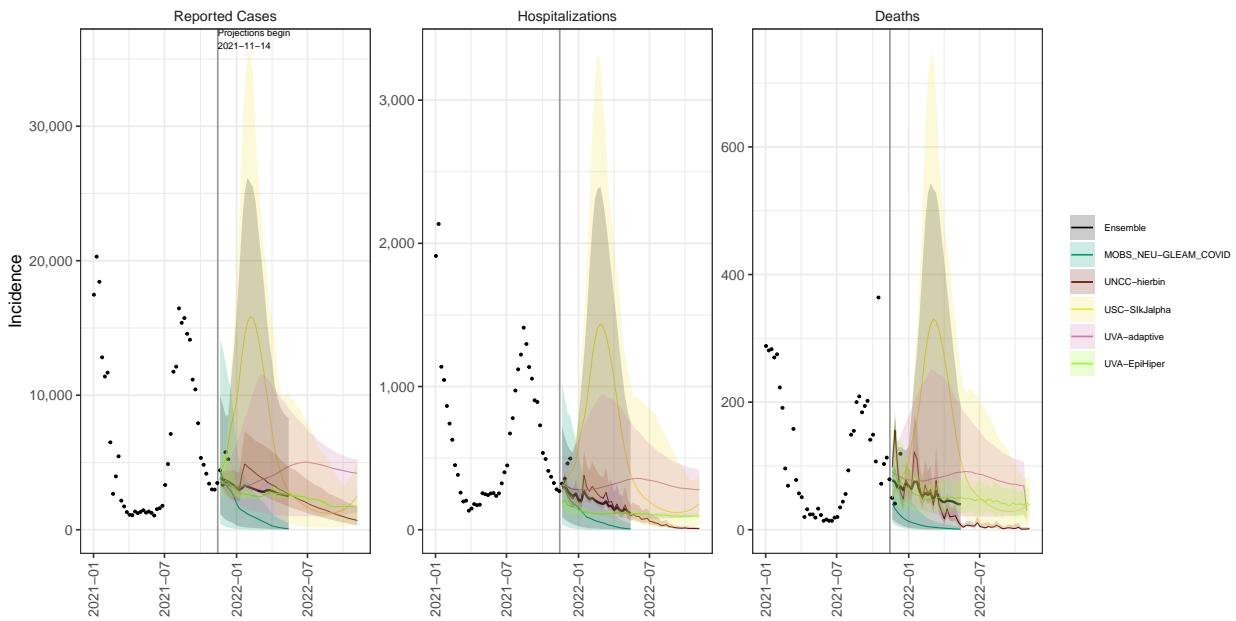
AK model variance & 95% projection intervals – Optimistic waning, low booster coverage



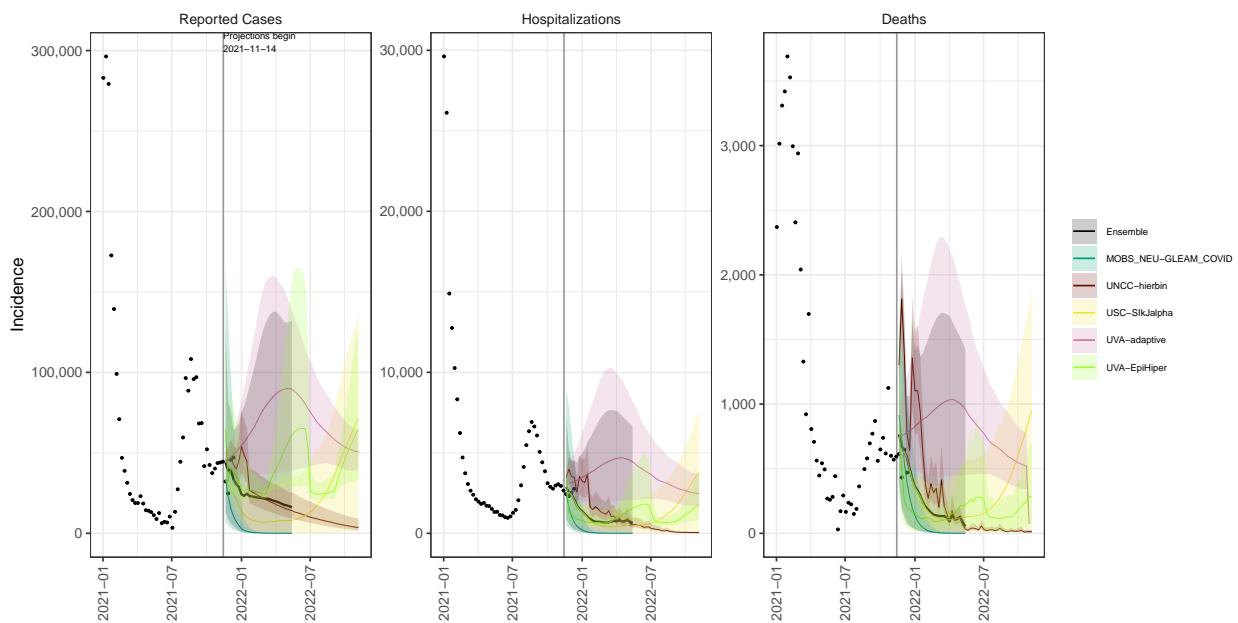
AZ model variance & 95% projection intervals – Optimistic waning, low booster coverage



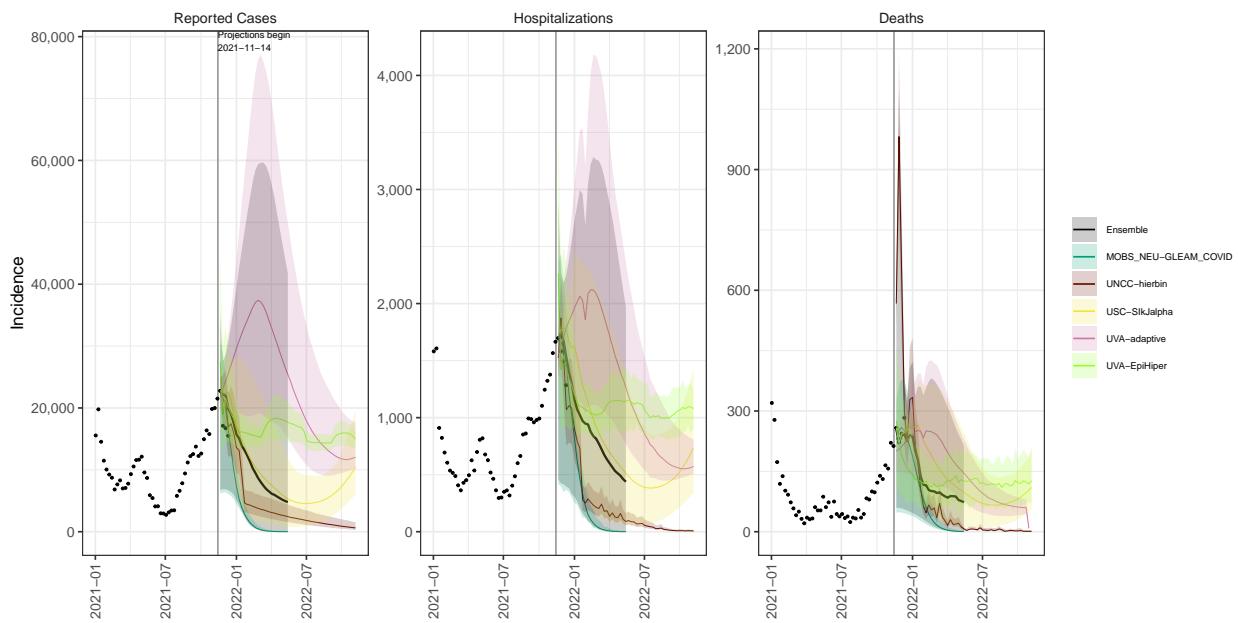
AR model variance & 95% projection intervals – Optimistic waning, low booster coverage



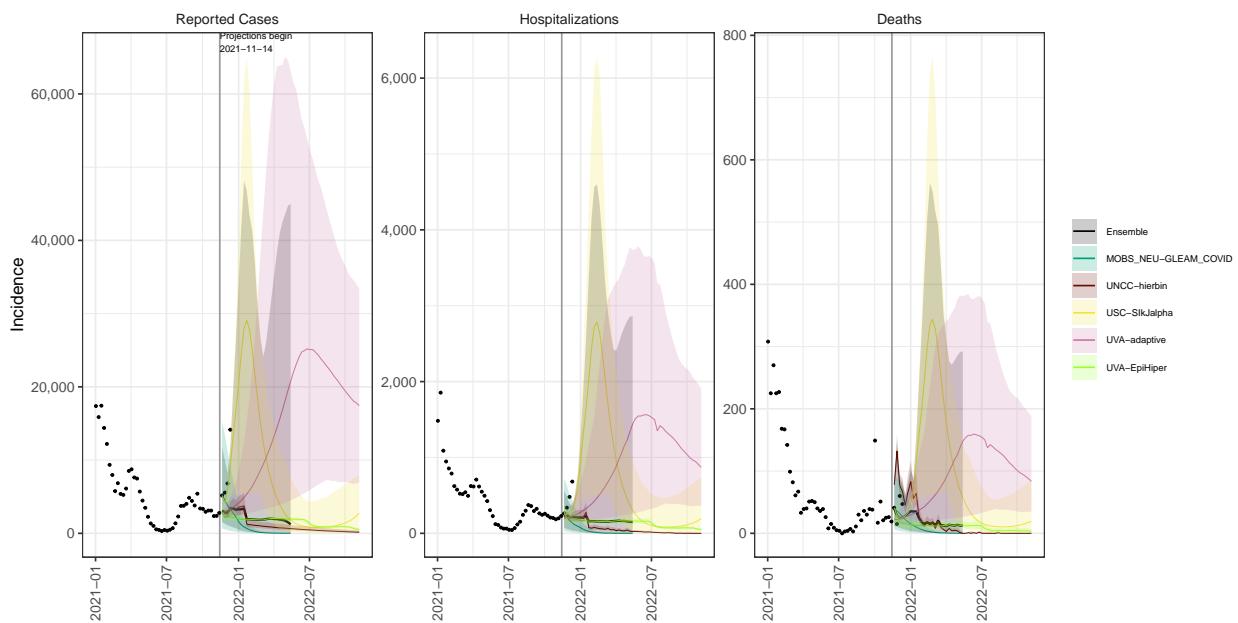
### CA model variance & 95% projection intervals – Optimistic waning, low booster coverage



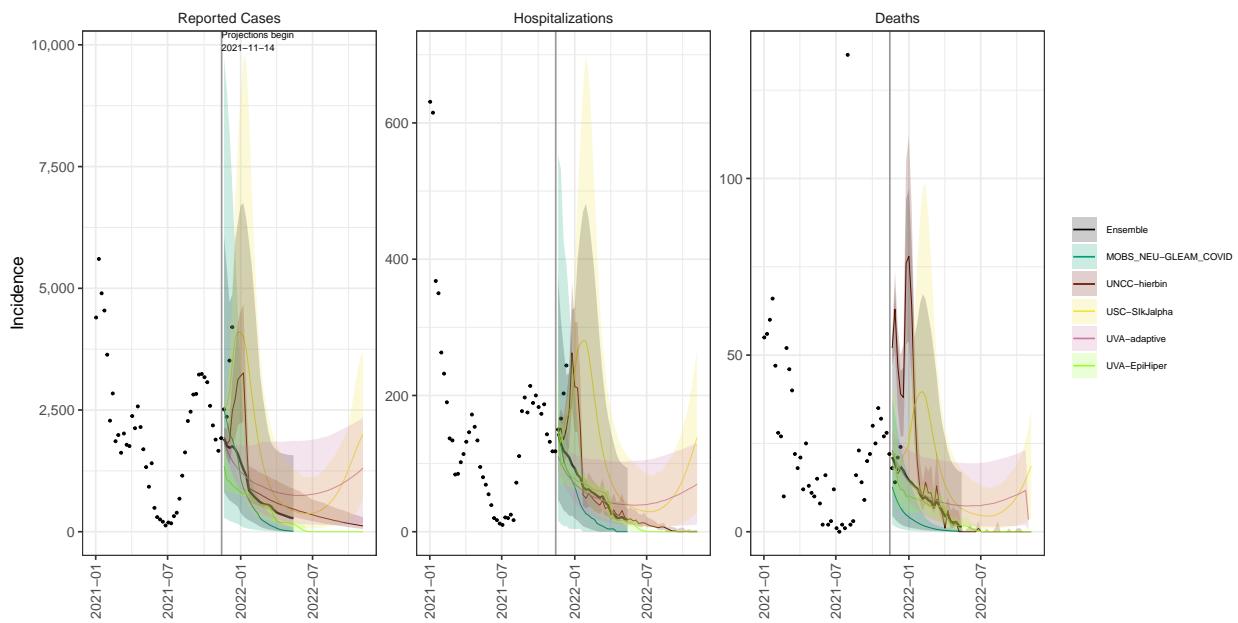
### CO model variance & 95% projection intervals – Optimistic waning, low booster coverage



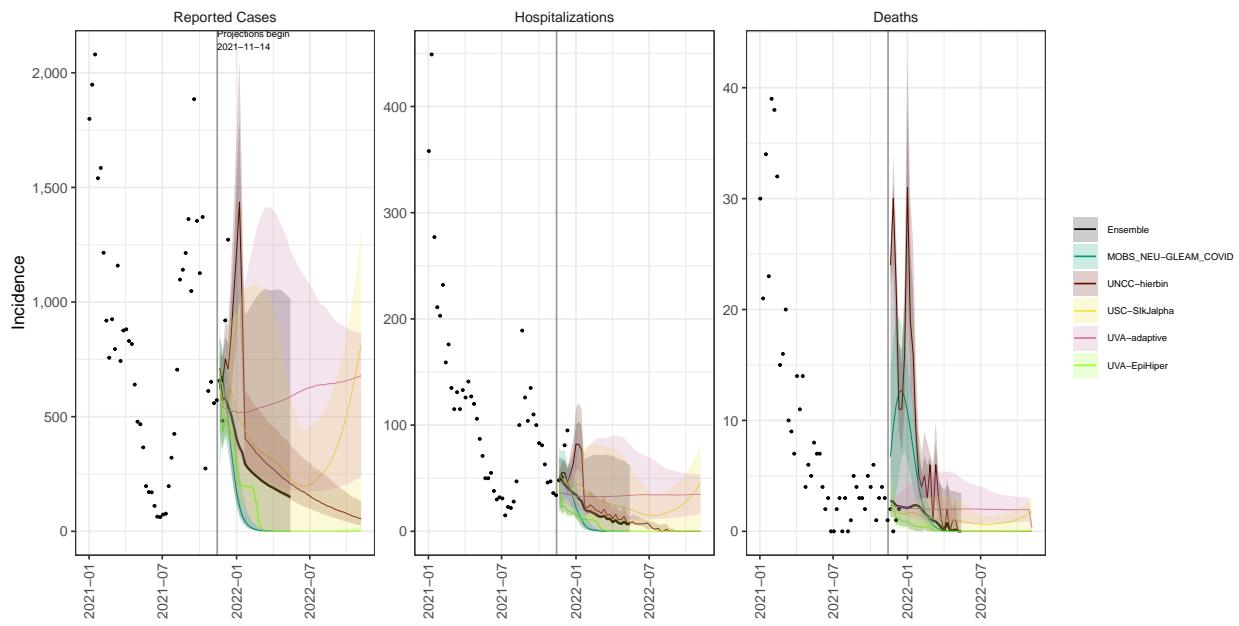
### CT model variance & 95% projection intervals – Optimistic waning, low booster coverage



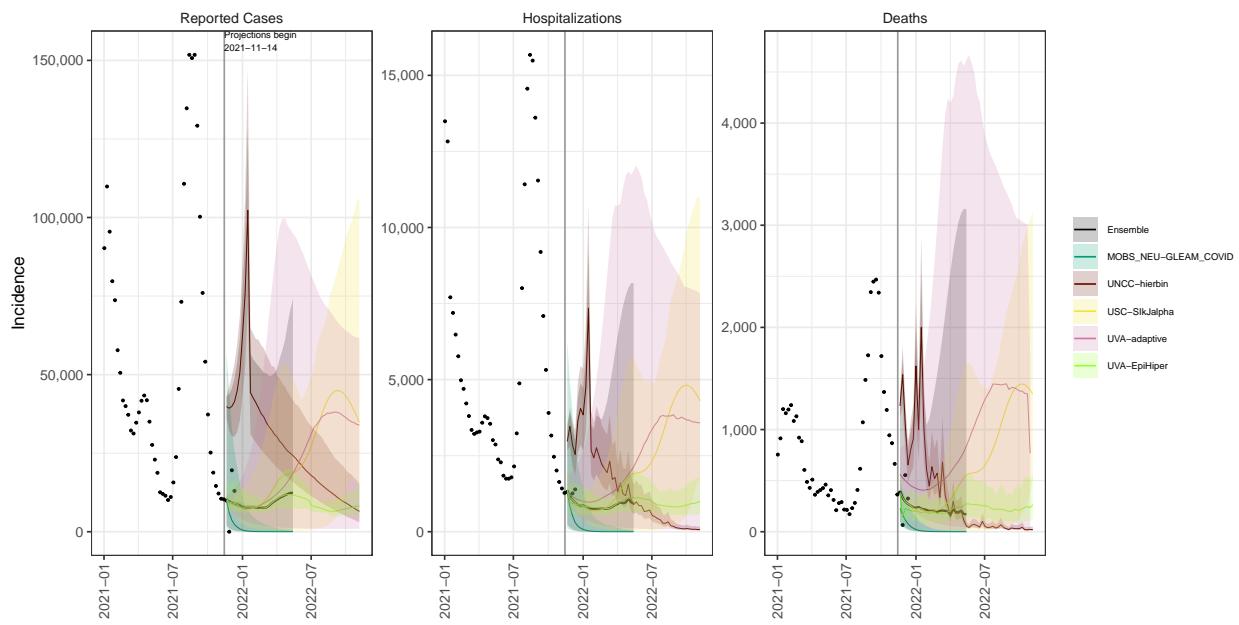
### DE model variance & 95% projection intervals – Optimistic waning, low booster coverage



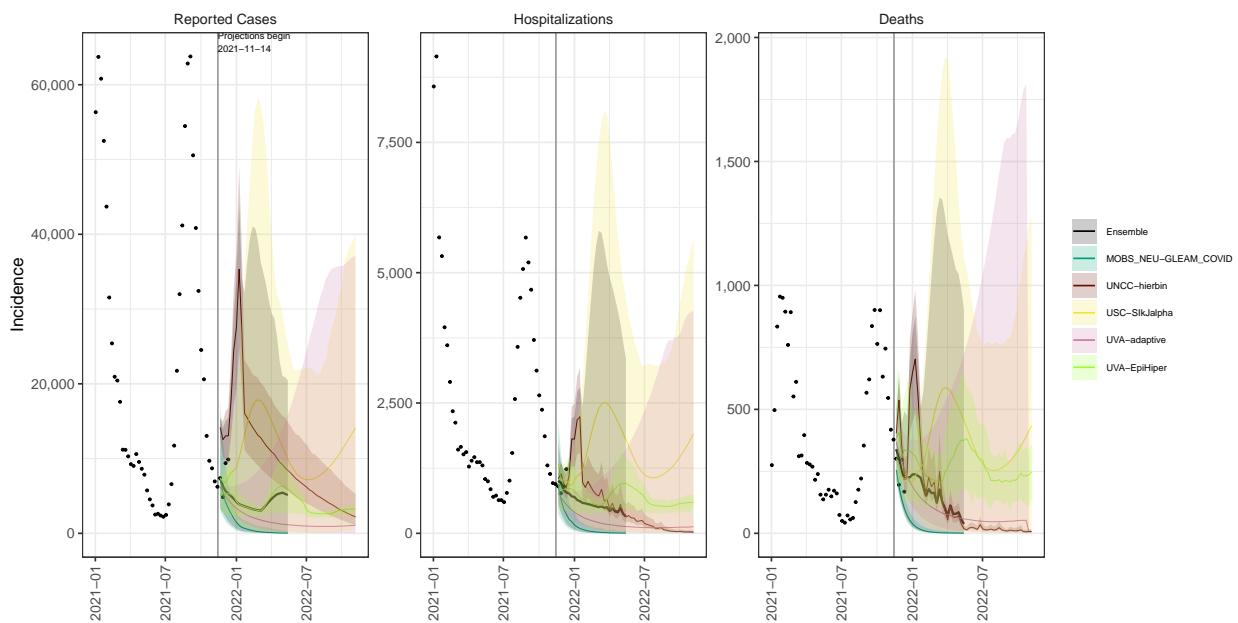
DC model variance & 95% projection intervals – Optimistic waning, low booster coverage



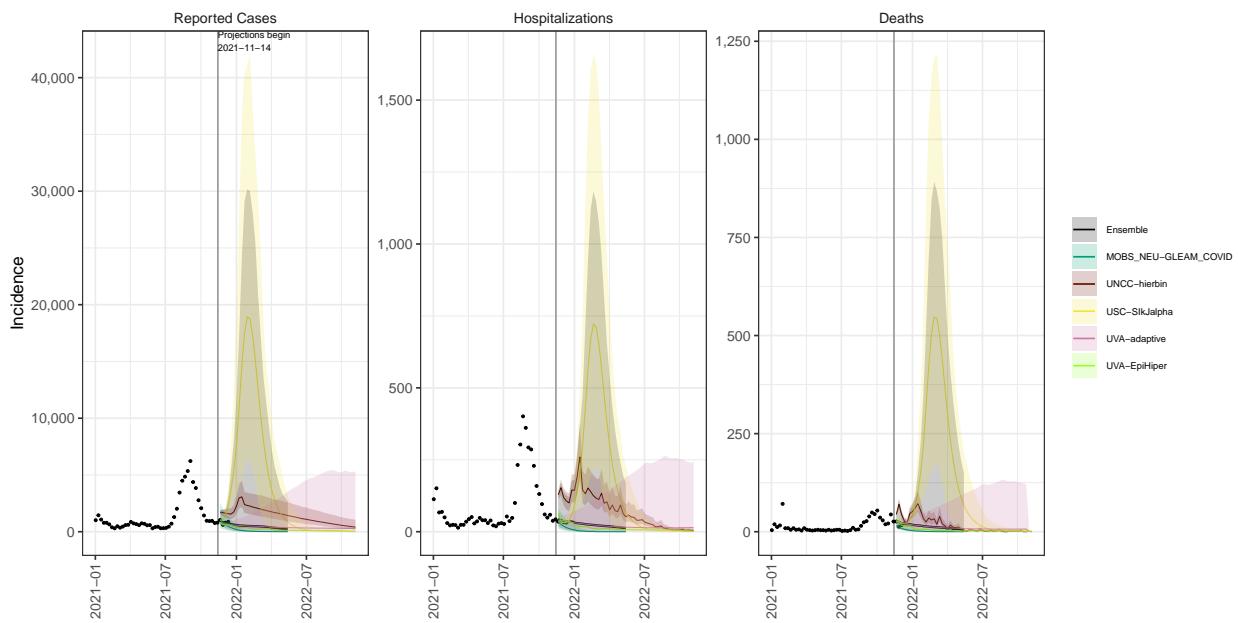
FL model variance & 95% projection intervals – Optimistic waning, low booster coverage



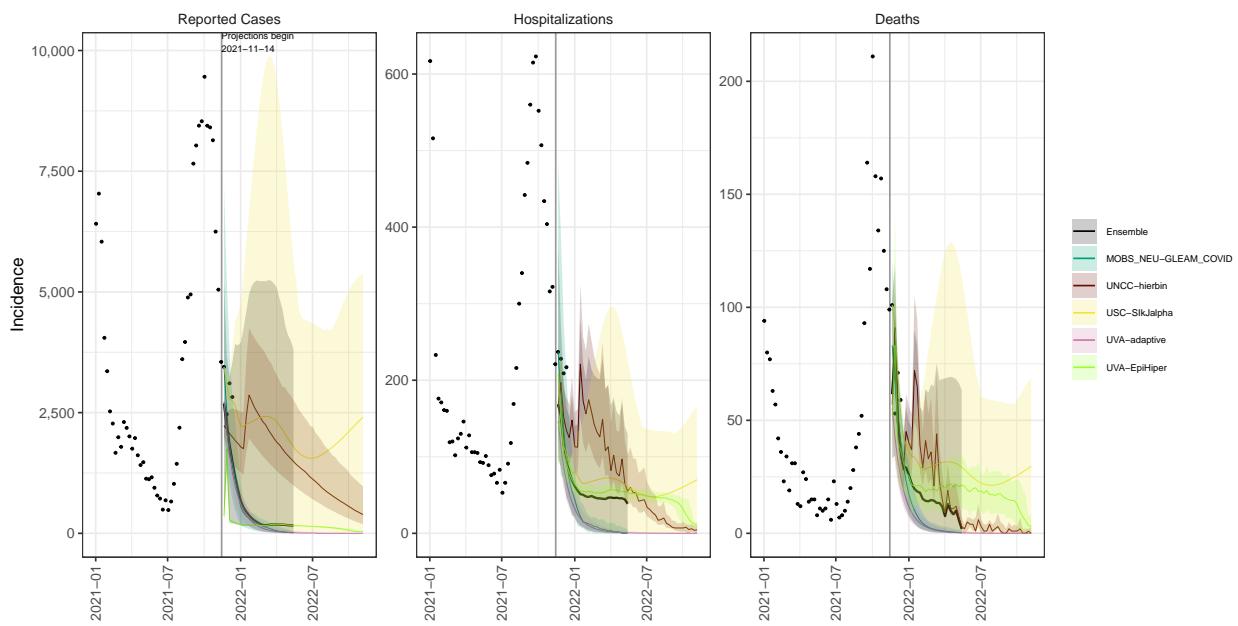
### GA model variance & 95% projection intervals – Optimistic waning, low booster coverage



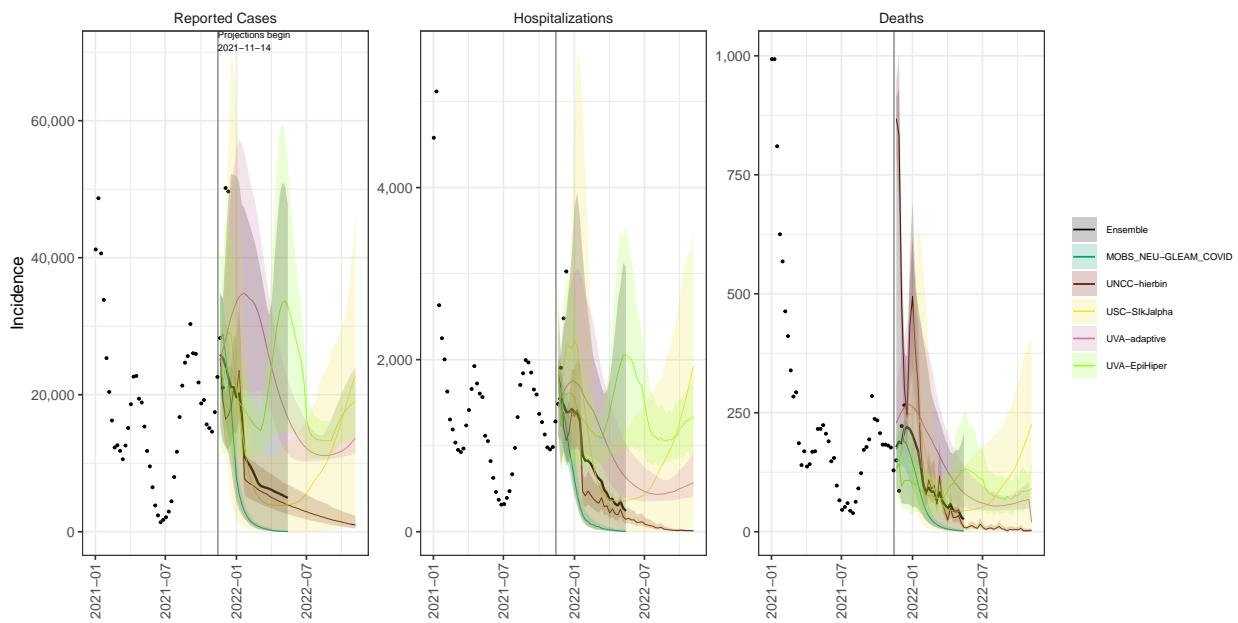
### HI model variance & 95% projection intervals – Optimistic waning, low booster coverage



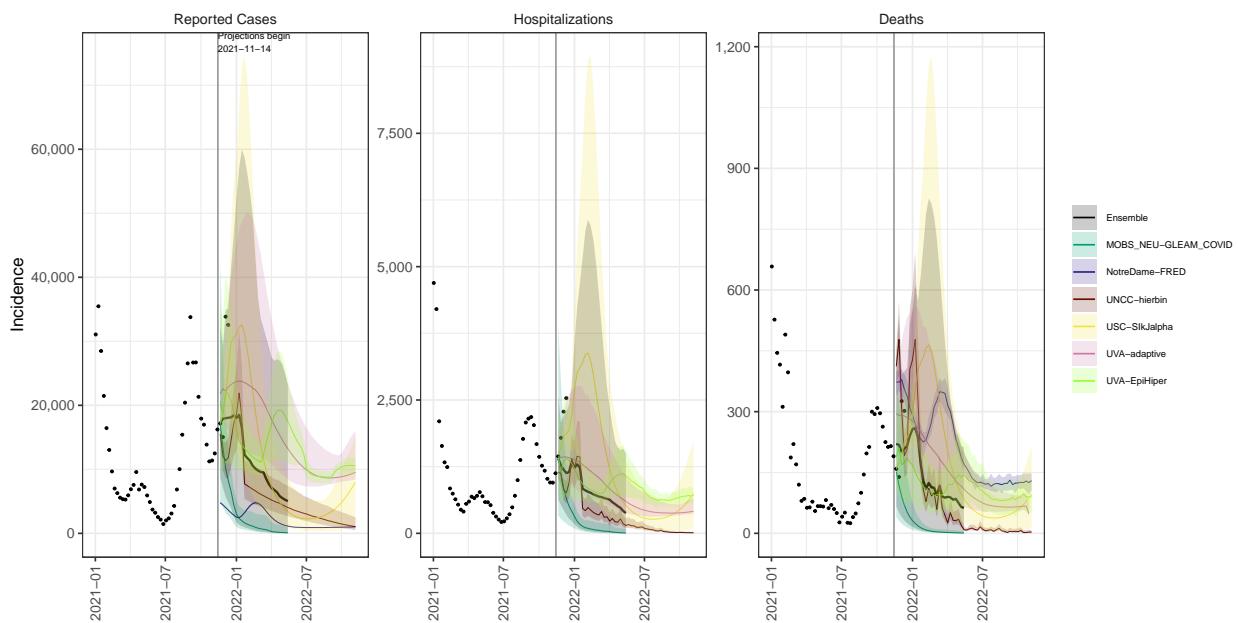
ID model variance & 95% projection intervals – Optimistic waning, low booster coverage



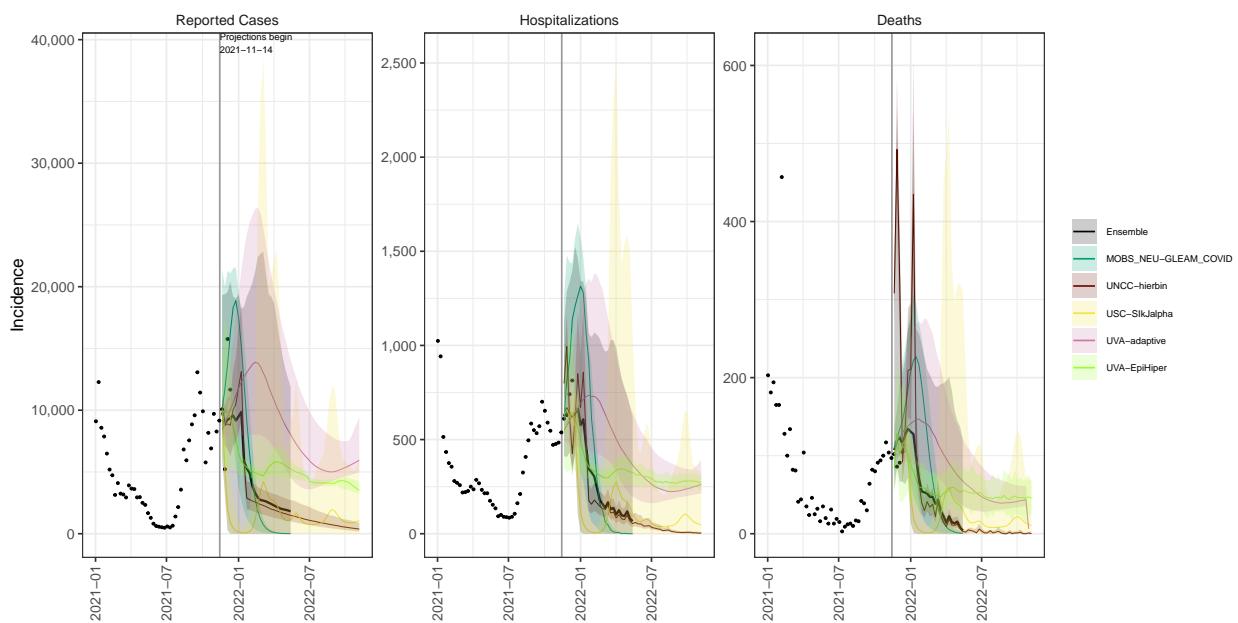
IL model variance & 95% projection intervals – Optimistic waning, low booster coverage



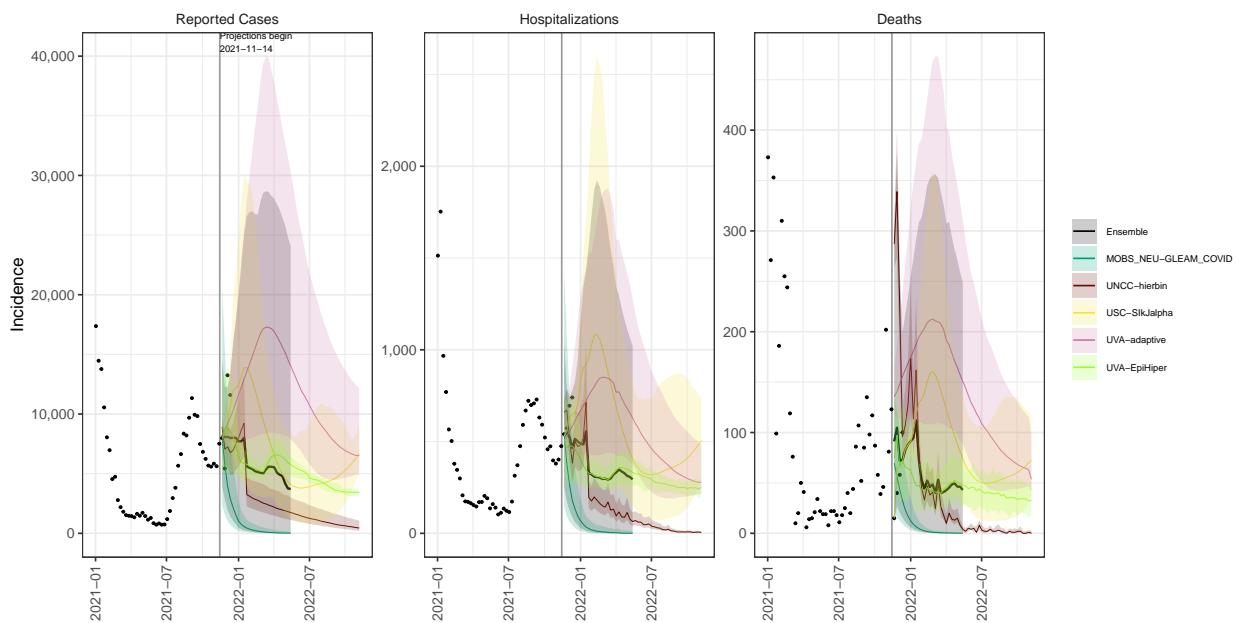
IN model variance & 95% projection intervals – Optimistic waning, low booster coverage



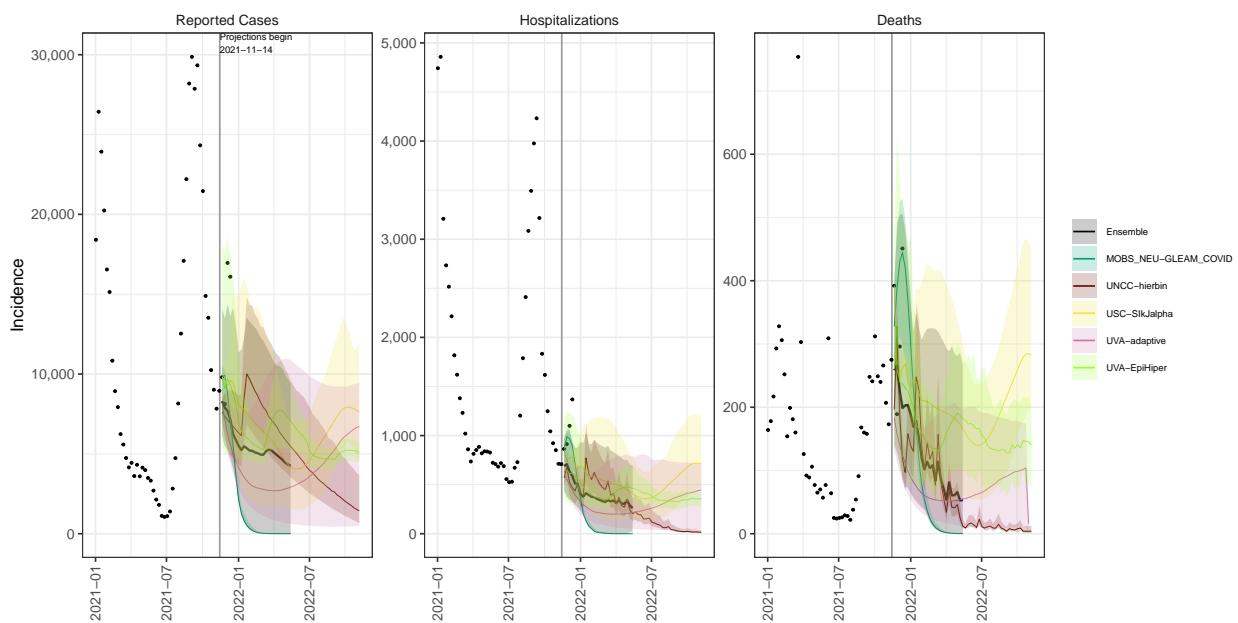
IA model variance & 95% projection intervals – Optimistic waning, low booster coverage



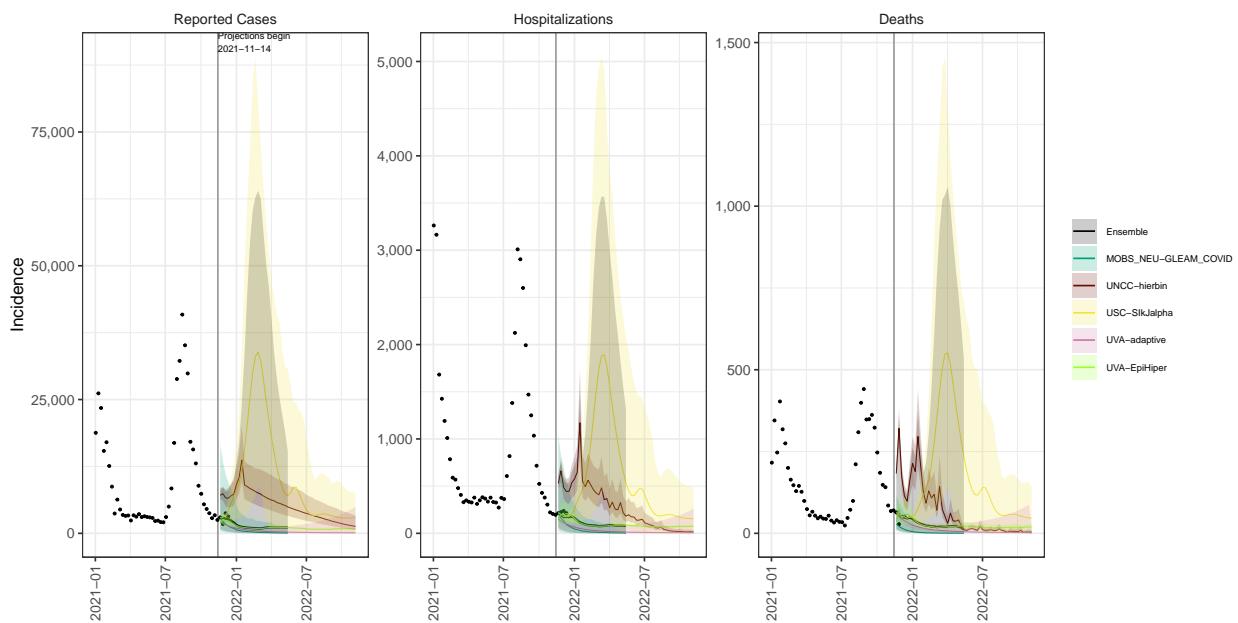
KS model variance & 95% projection intervals – Optimistic waning, low booster coverage



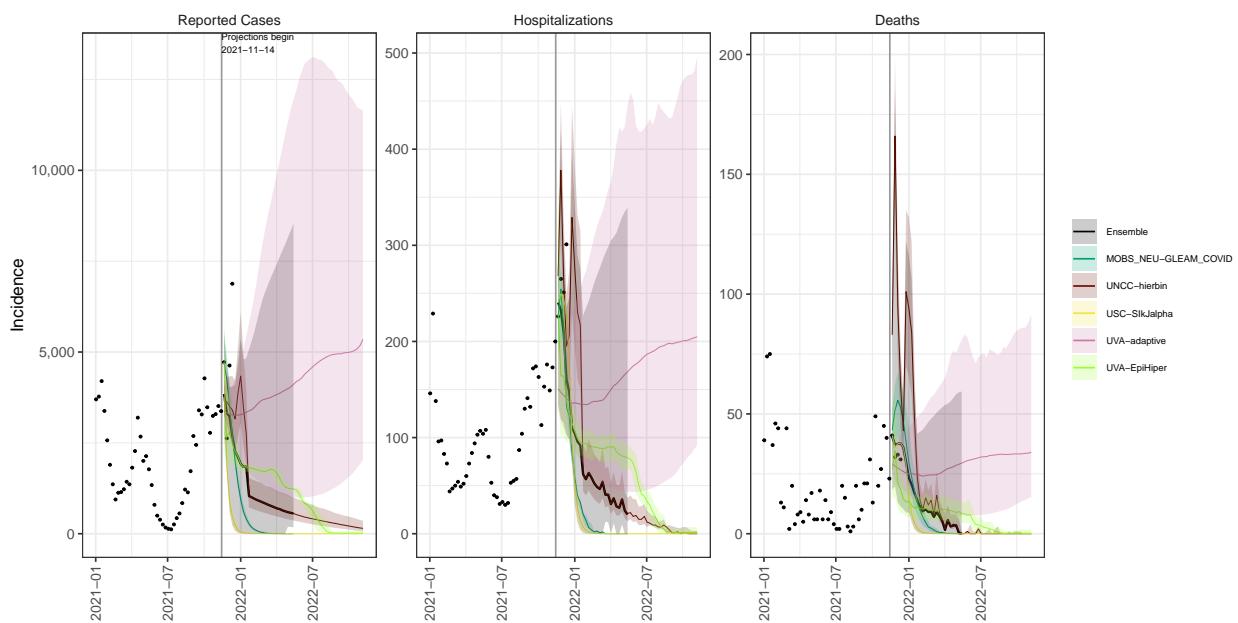
KY model variance & 95% projection intervals – Optimistic waning, low booster coverage



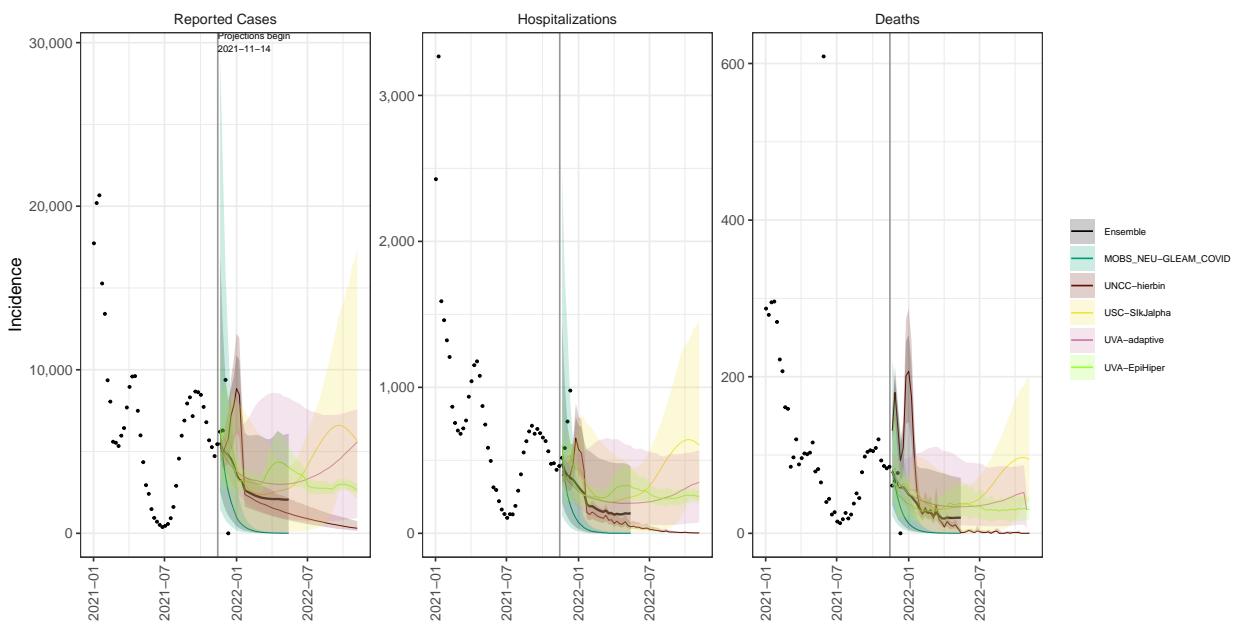
LA model variance & 95% projection intervals – Optimistic waning, low booster coverage



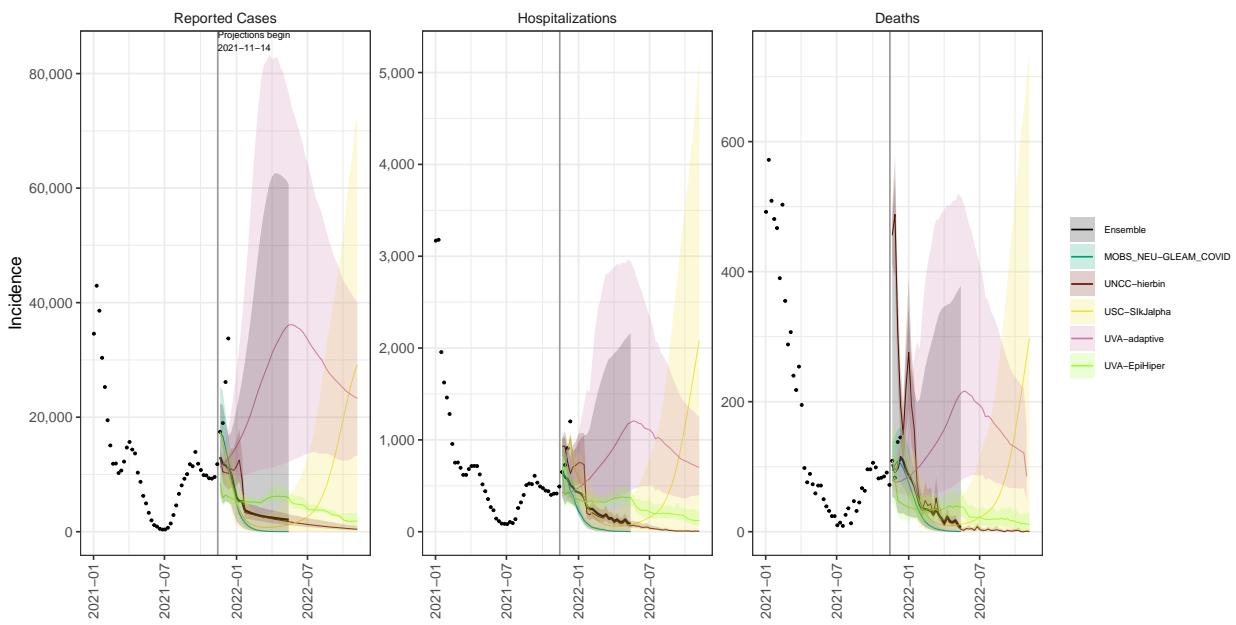
ME model variance & 95% projection intervals – Optimistic waning, low booster coverage



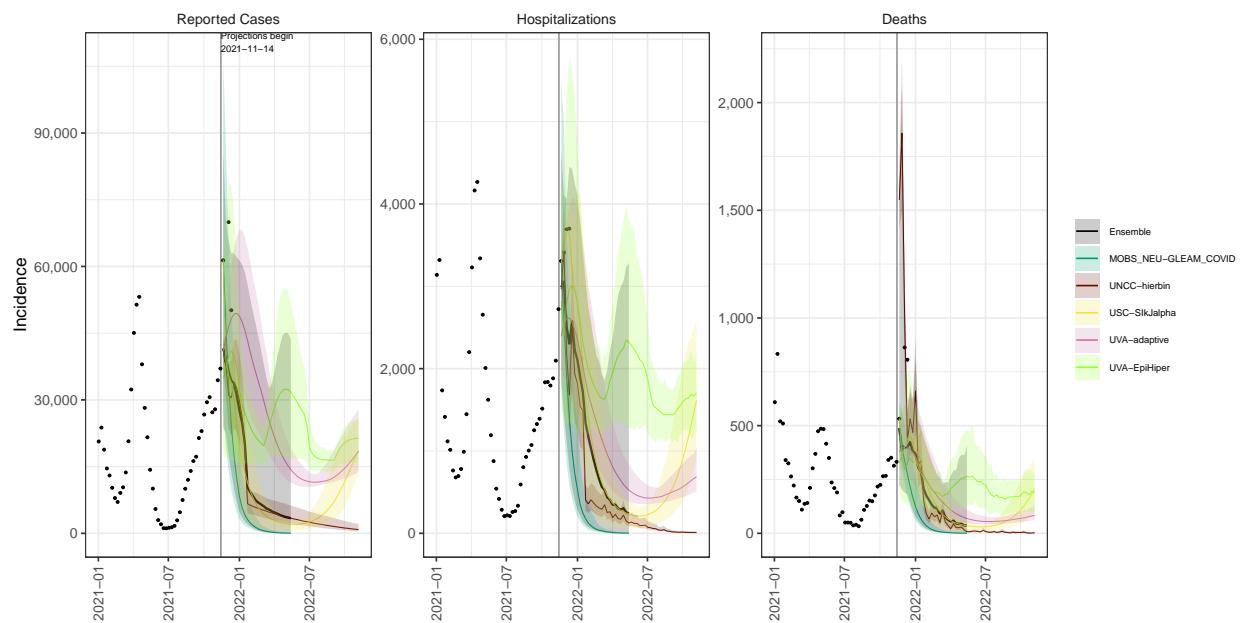
MD model variance & 95% projection intervals – Optimistic waning, low booster coverage



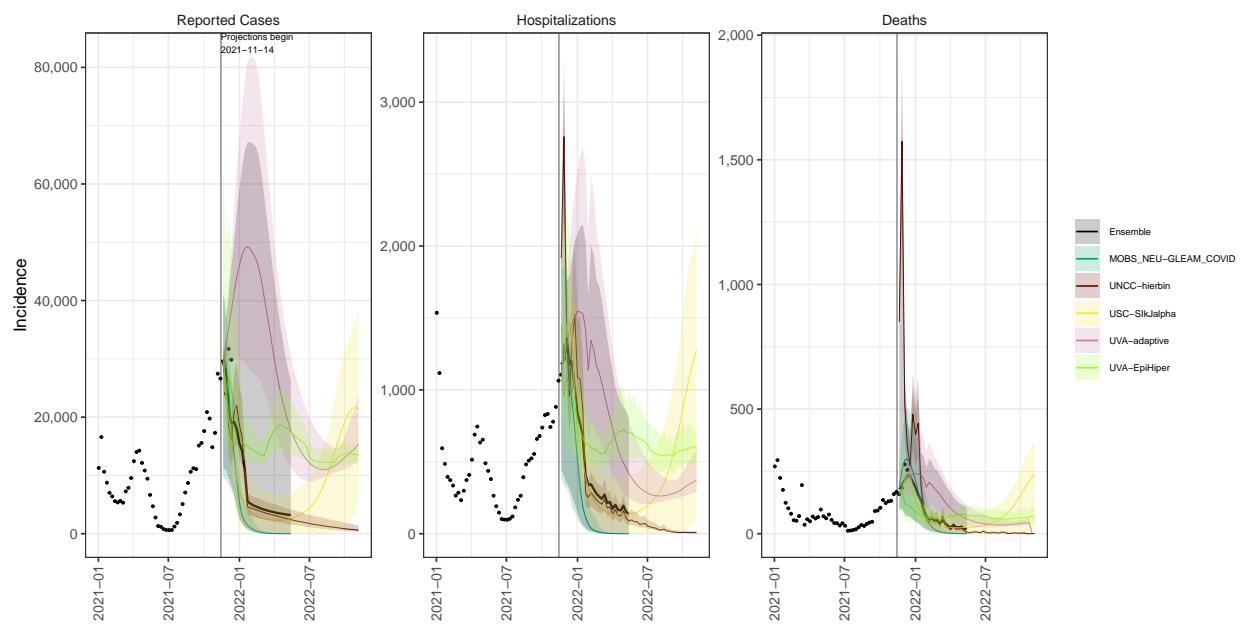
MA model variance & 95% projection intervals – Optimistic waning, low booster coverage



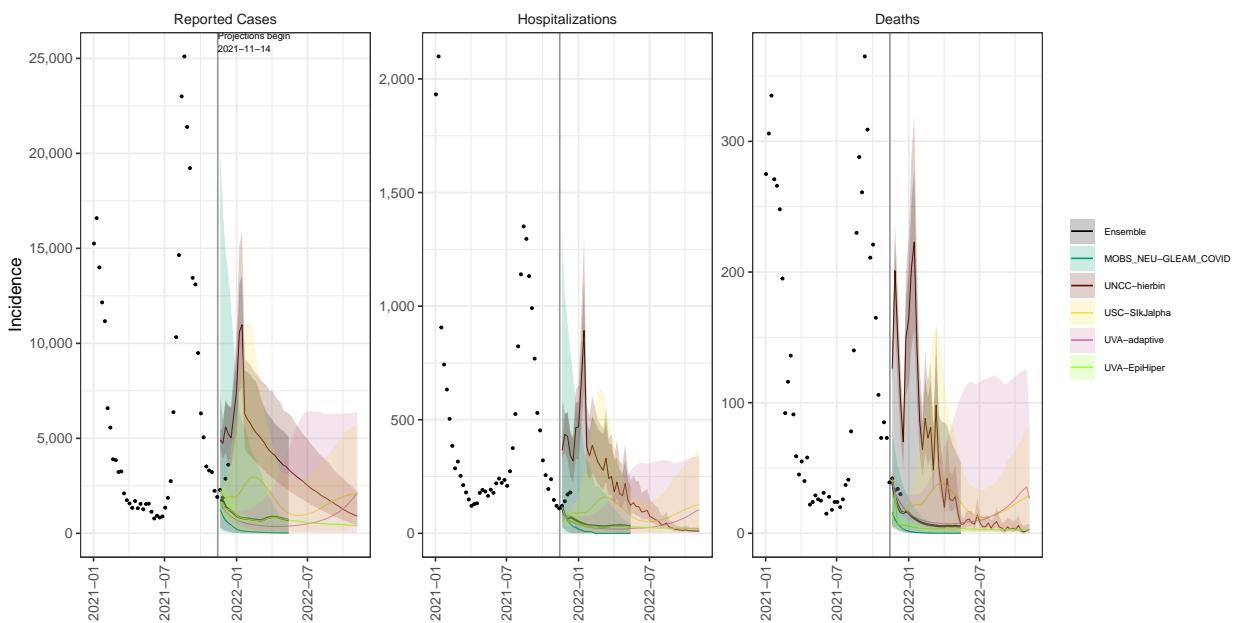
MI model variance & 95% projection intervals – Optimistic waning, low booster coverage



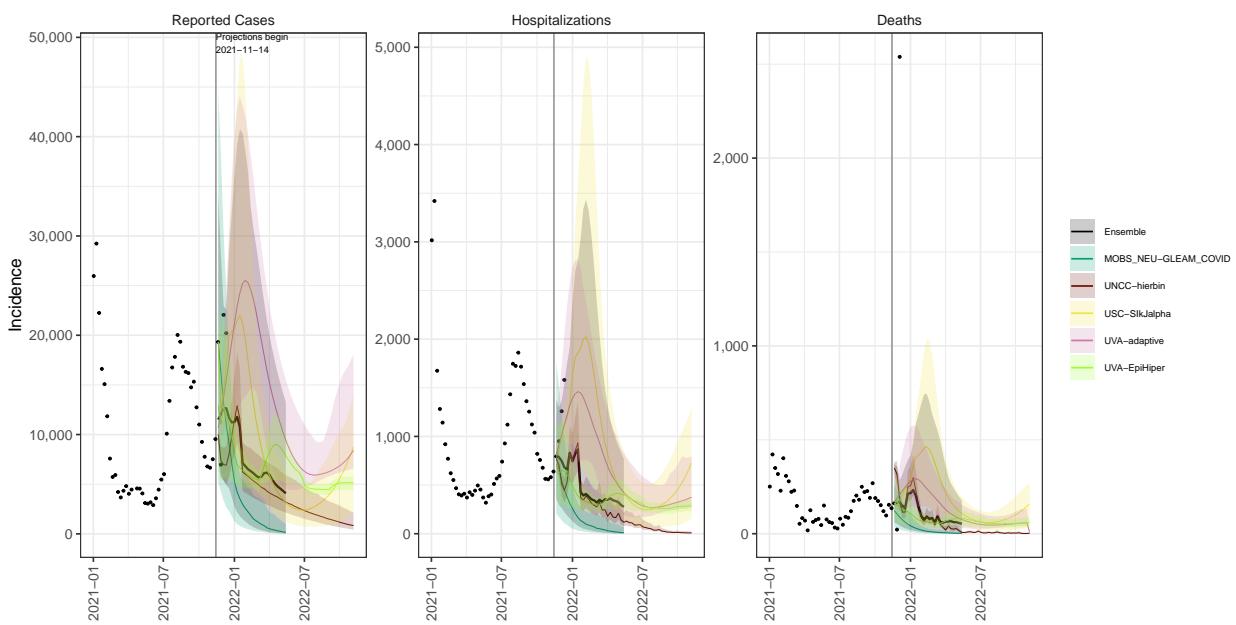
MN model variance & 95% projection intervals – Optimistic waning, low booster coverage



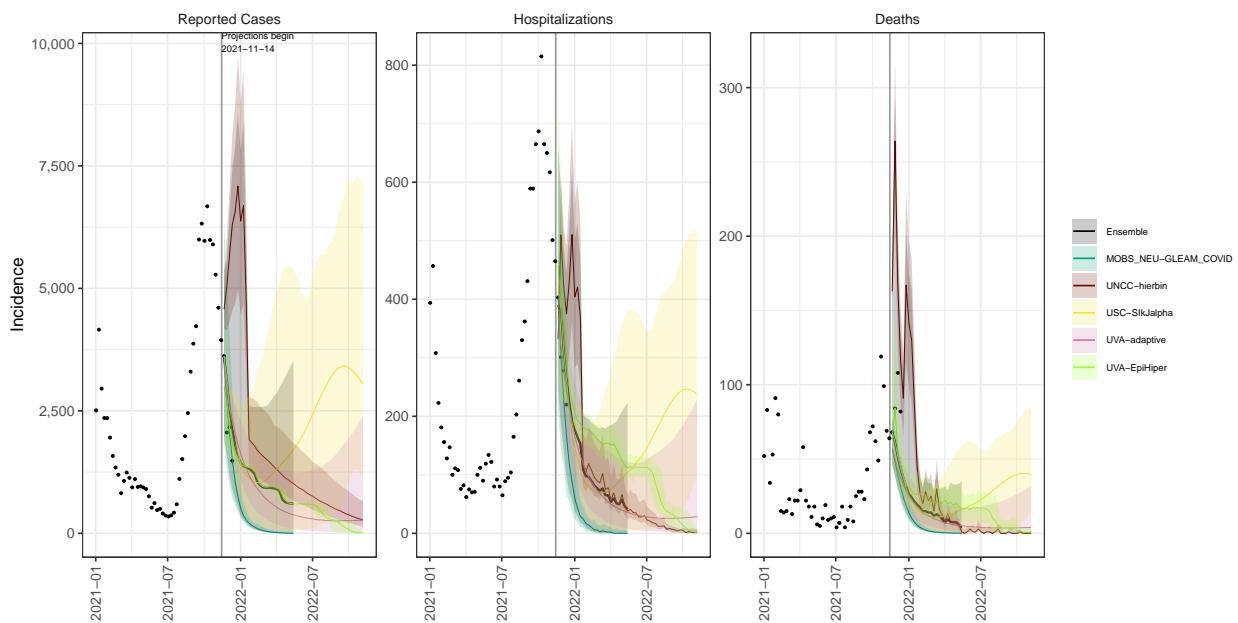
### MS model variance & 95% projection intervals – Optimistic waning, low booster coverage



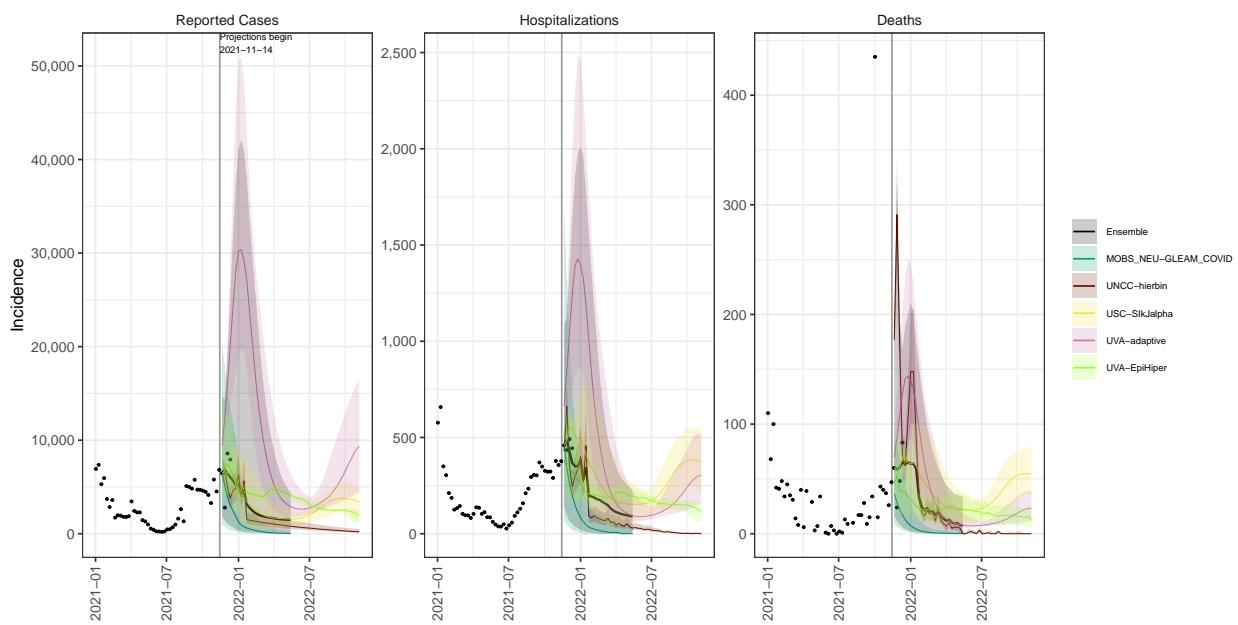
### MO model variance & 95% projection intervals – Optimistic waning, low booster coverage



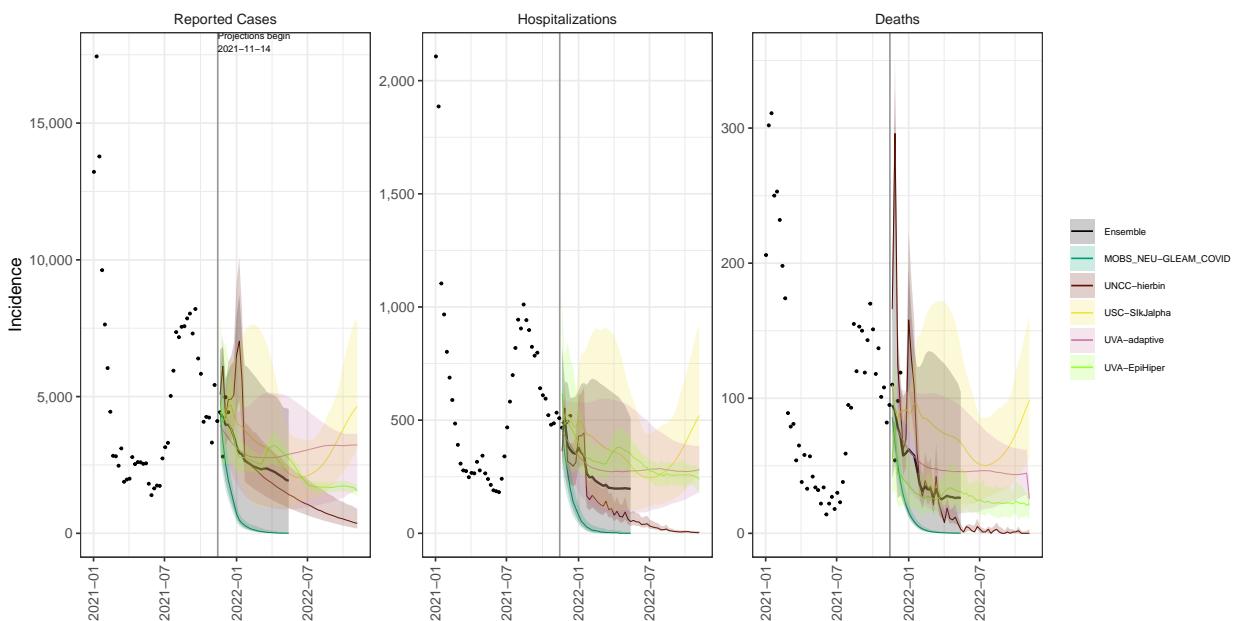
### MT model variance & 95% projection intervals – Optimistic waning, low booster coverage



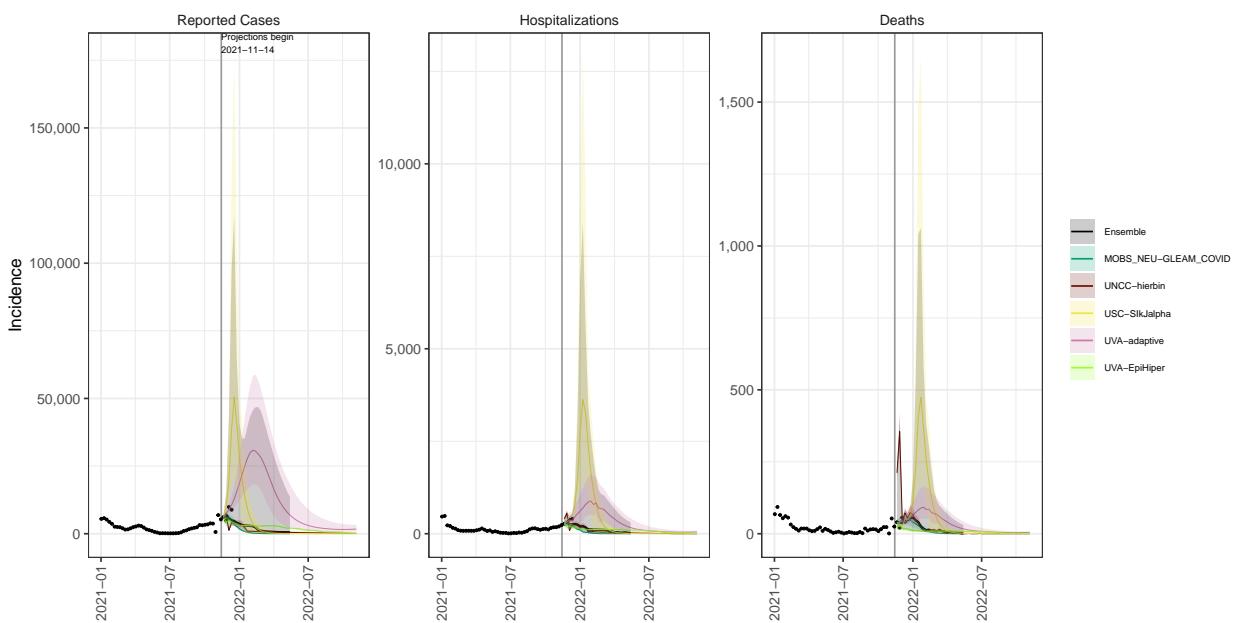
### NE model variance & 95% projection intervals – Optimistic waning, low booster coverage



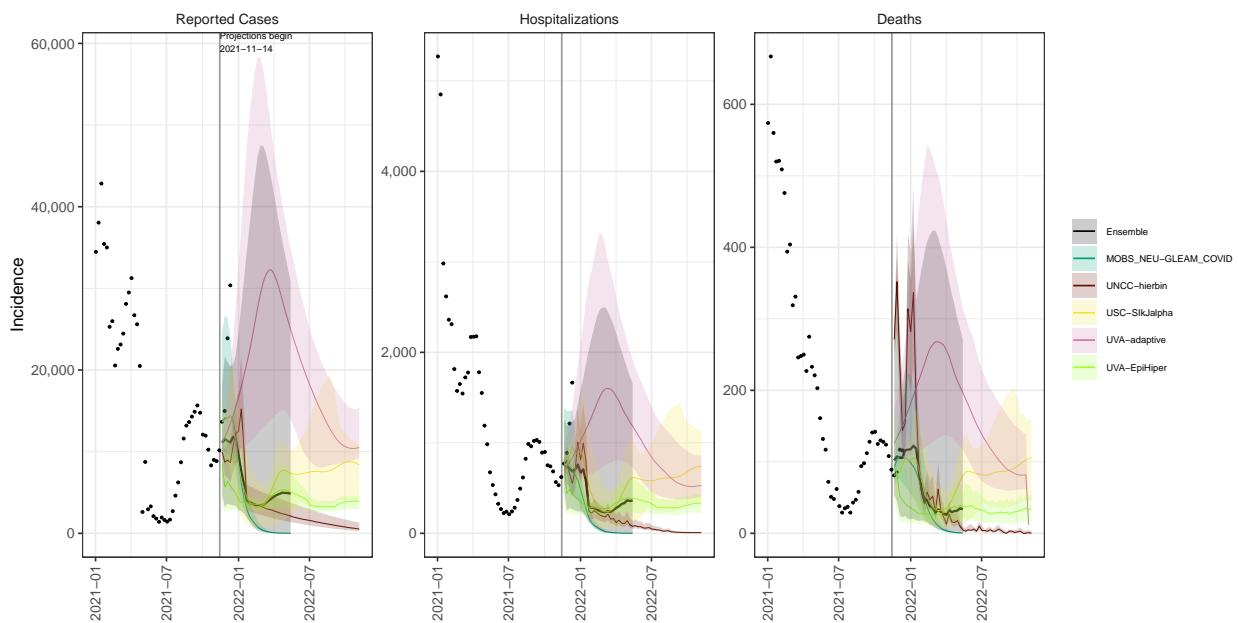
### NV model variance & 95% projection intervals – Optimistic waning, low booster coverage



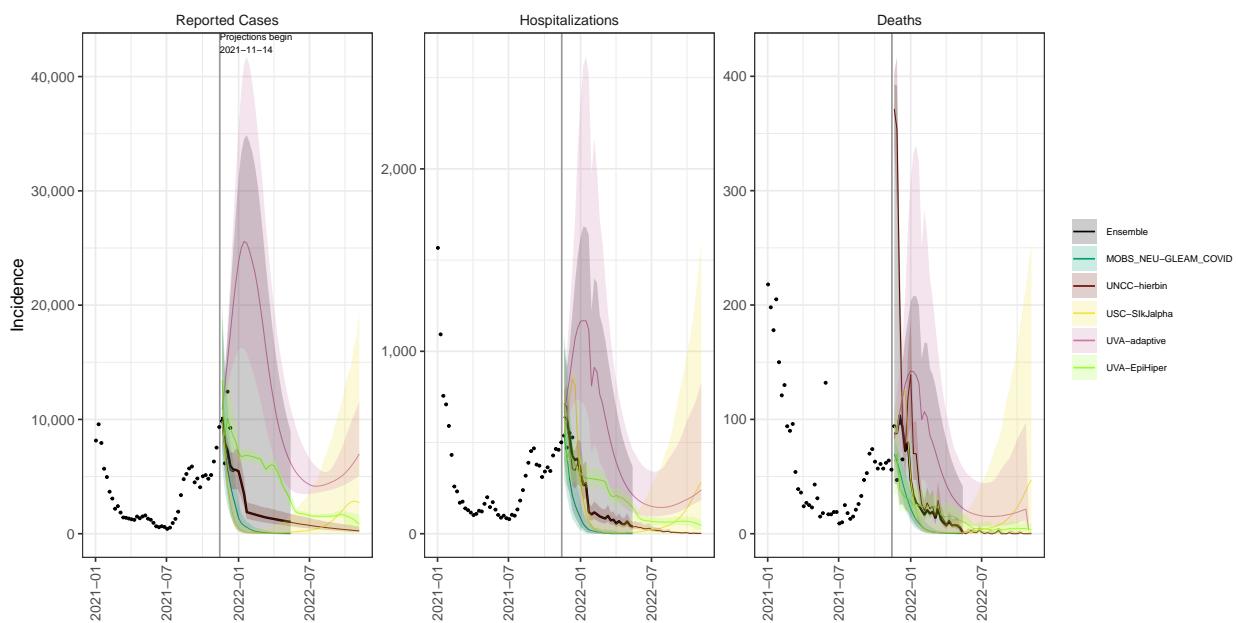
### NH model variance & 95% projection intervals – Optimistic waning, low booster coverage



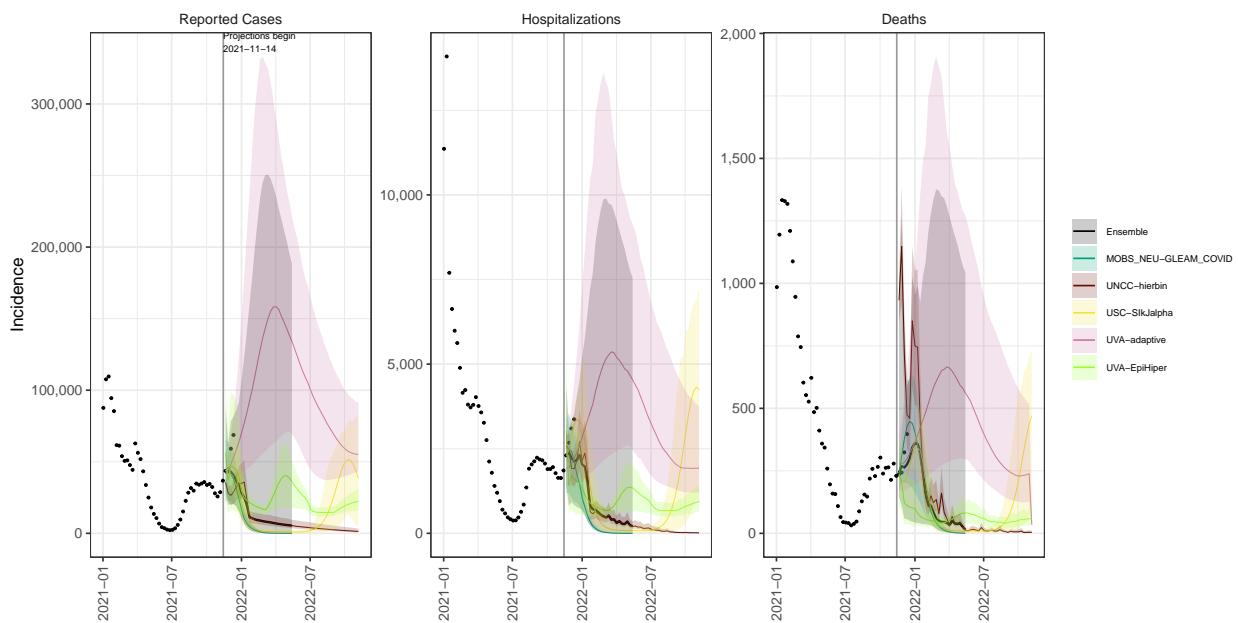
### NJ model variance & 95% projection intervals – Optimistic waning, low booster coverage



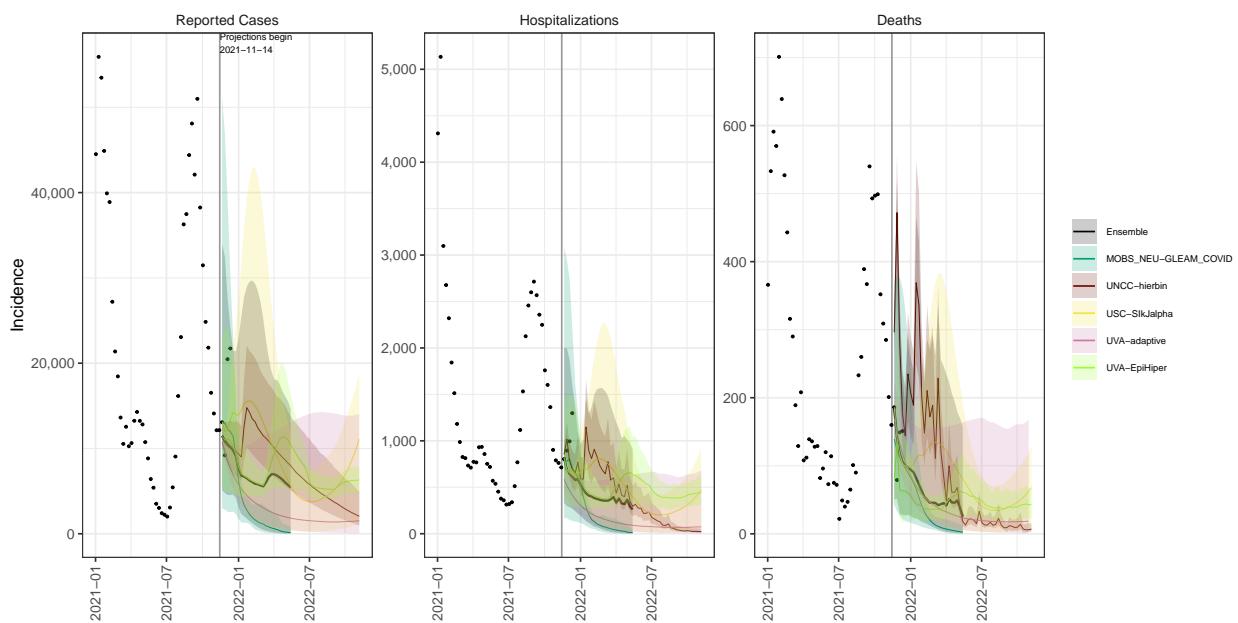
### NM model variance & 95% projection intervals – Optimistic waning, low booster coverage



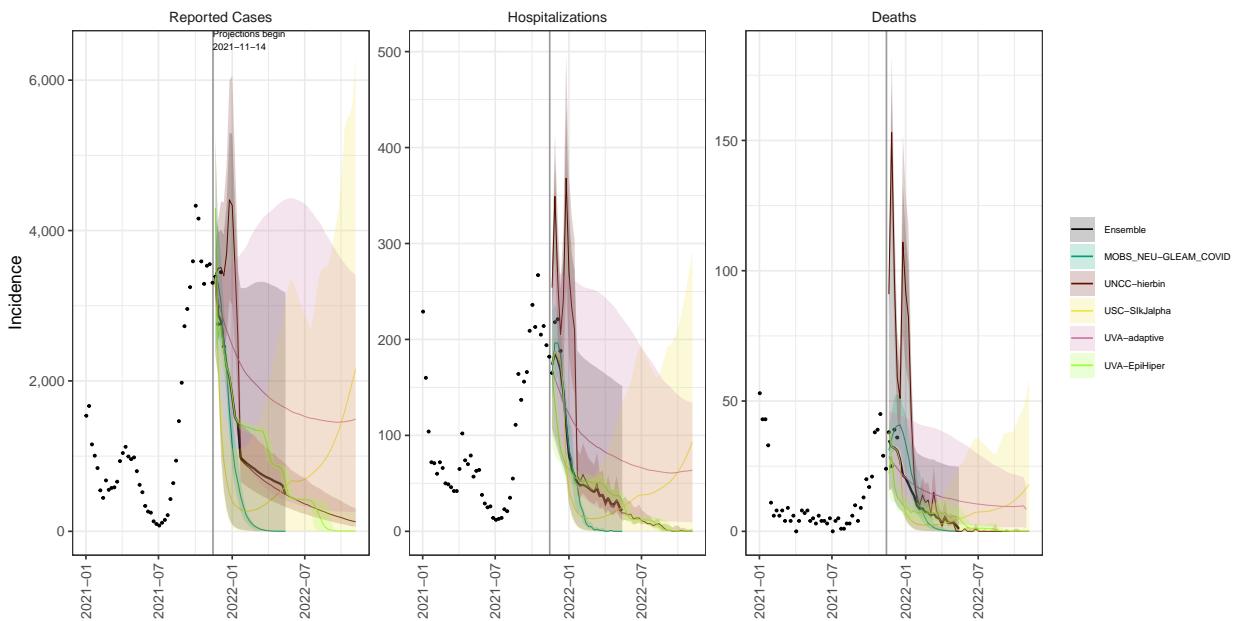
NY model variance & 95% projection intervals – Optimistic waning, low booster coverage



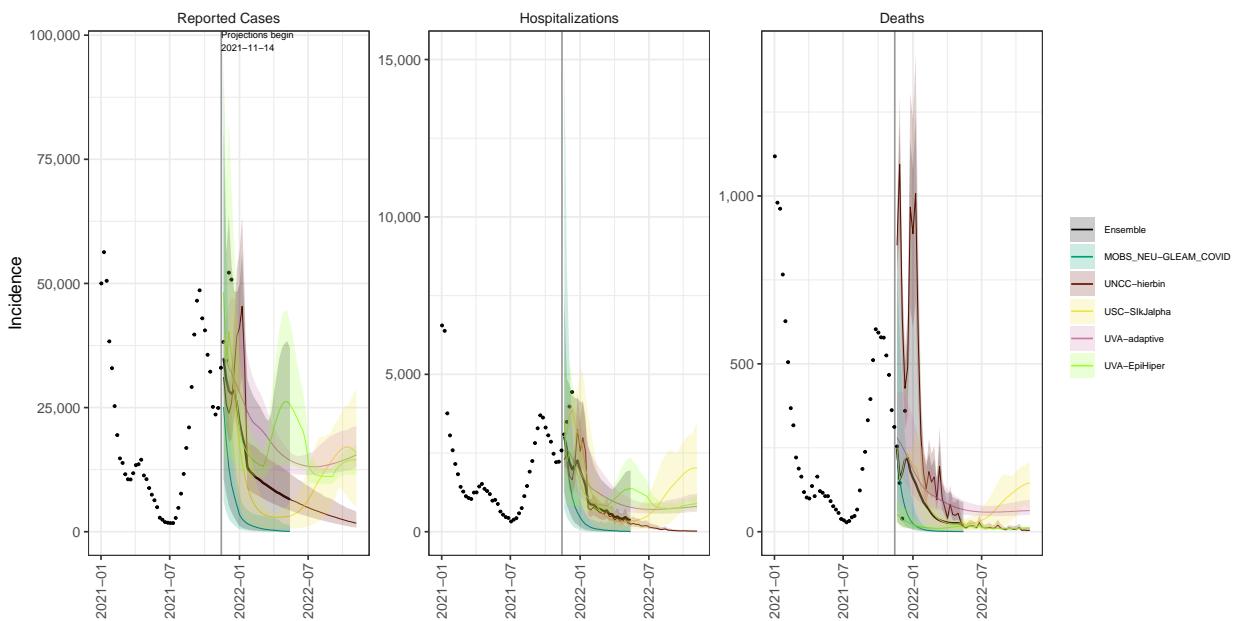
NC model variance & 95% projection intervals – Optimistic waning, low booster coverage



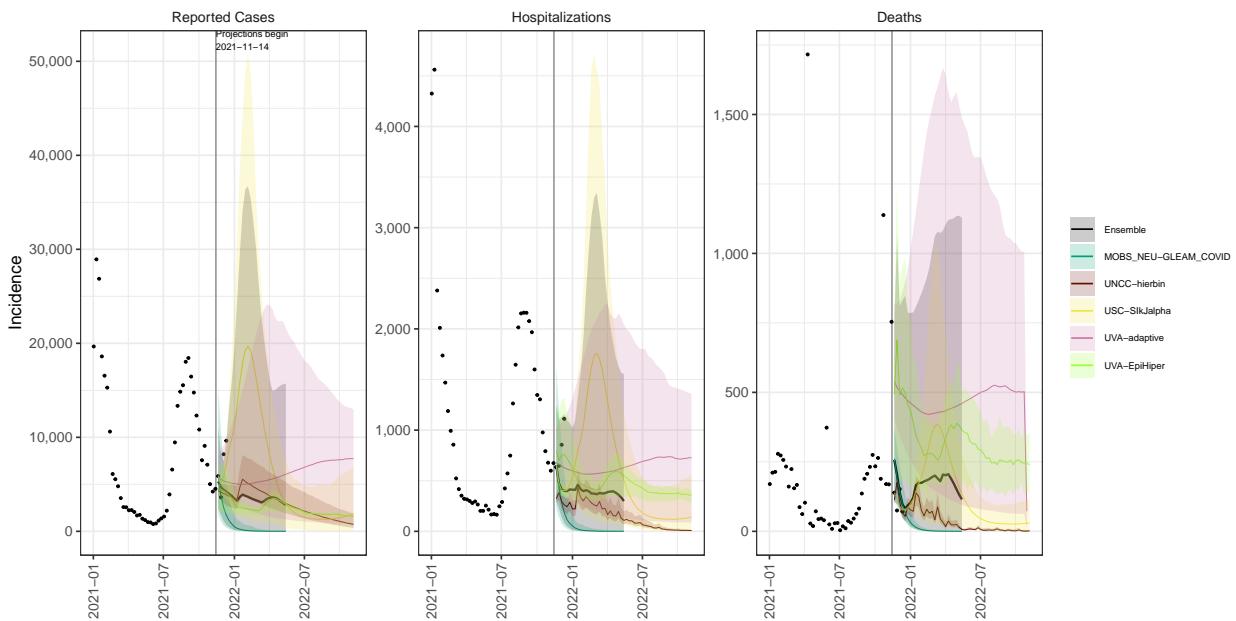
ND model variance & 95% projection intervals – Optimistic waning, low booster coverage



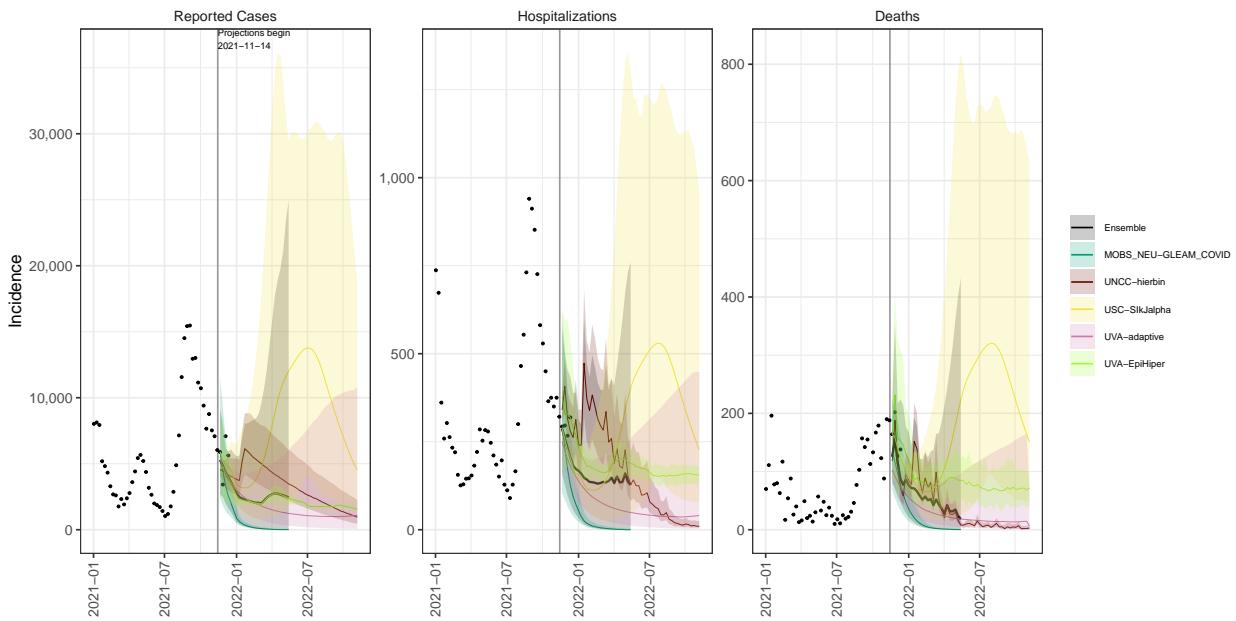
OH model variance & 95% projection intervals – Optimistic waning, low booster coverage



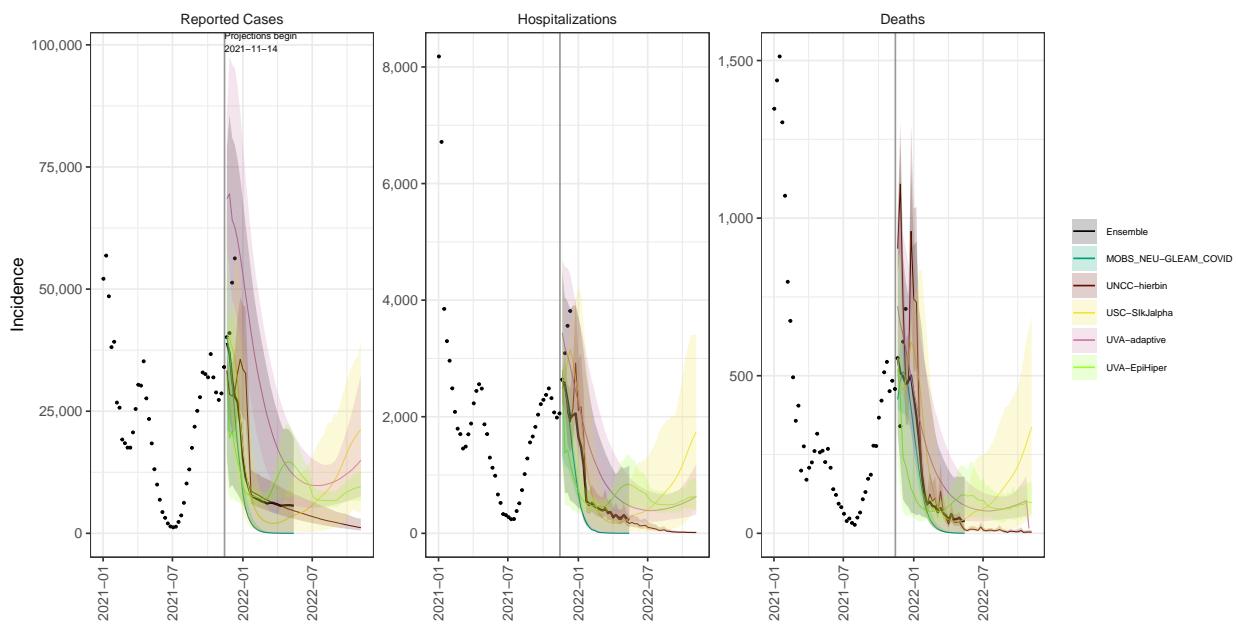
OK model variance & 95% projection intervals – Optimistic waning, low booster coverage



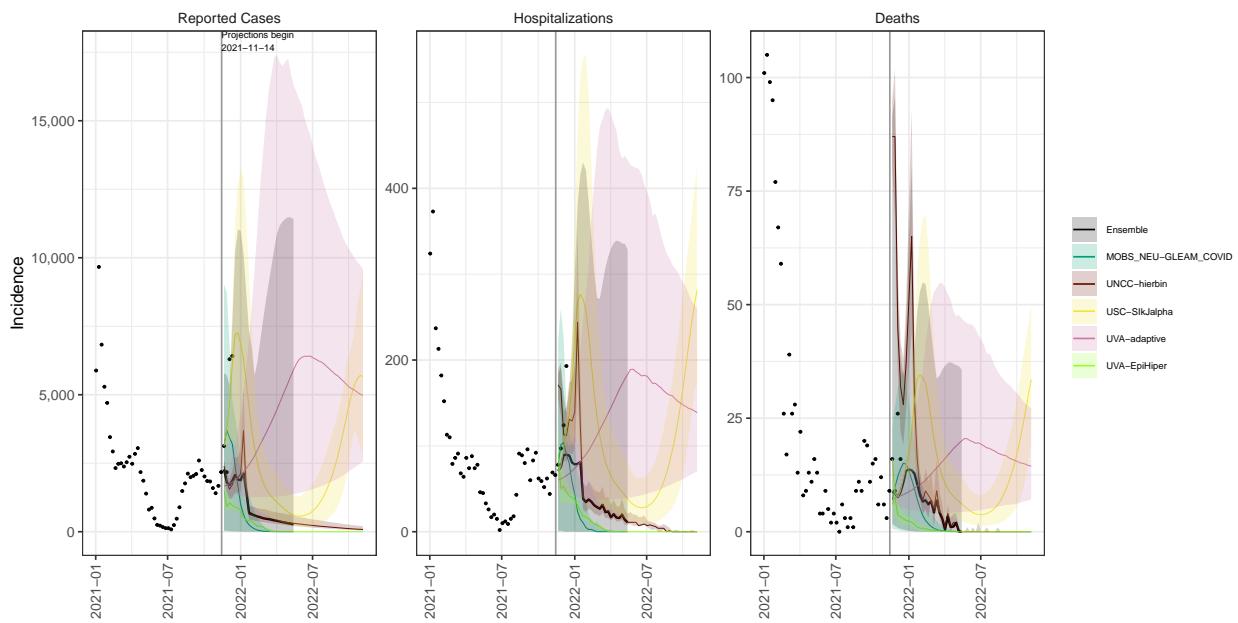
OR model variance & 95% projection intervals – Optimistic waning, low booster coverage



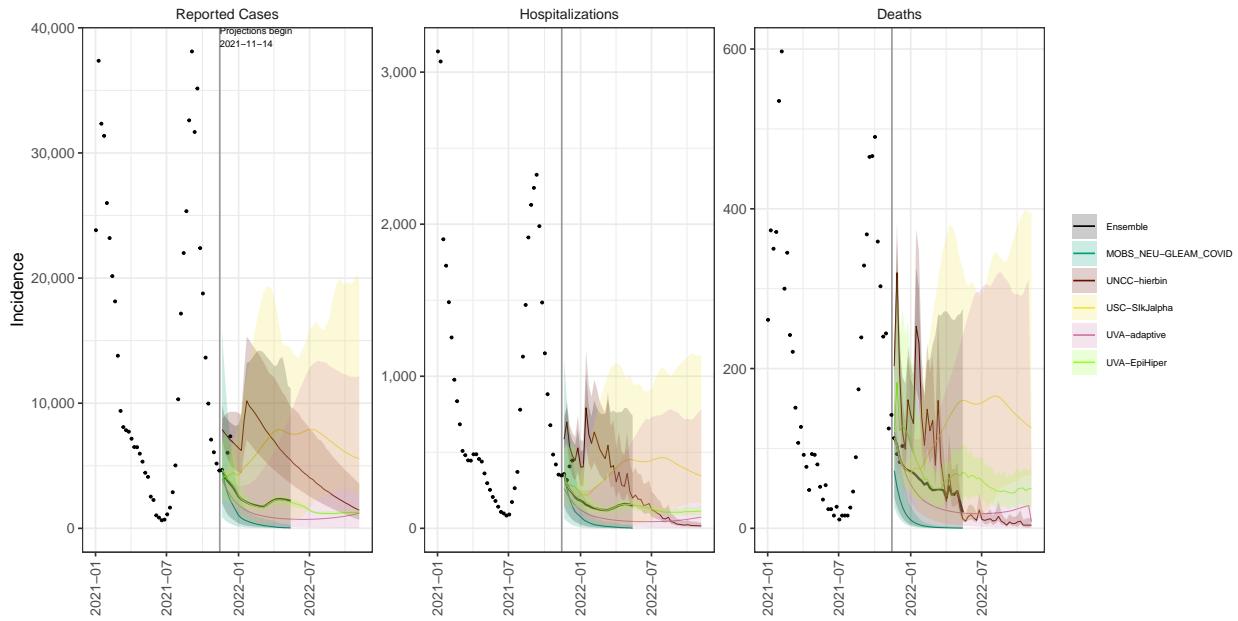
PA model variance & 95% projection intervals – Optimistic waning, low booster coverage



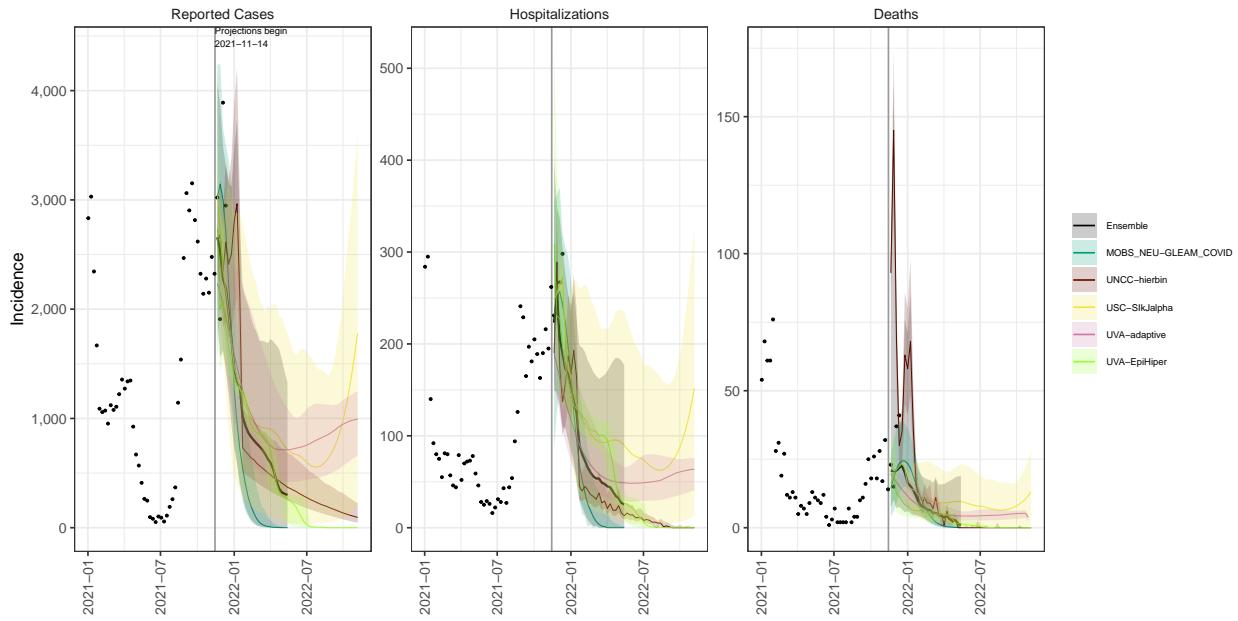
RI model variance & 95% projection intervals – Optimistic waning, low booster coverage



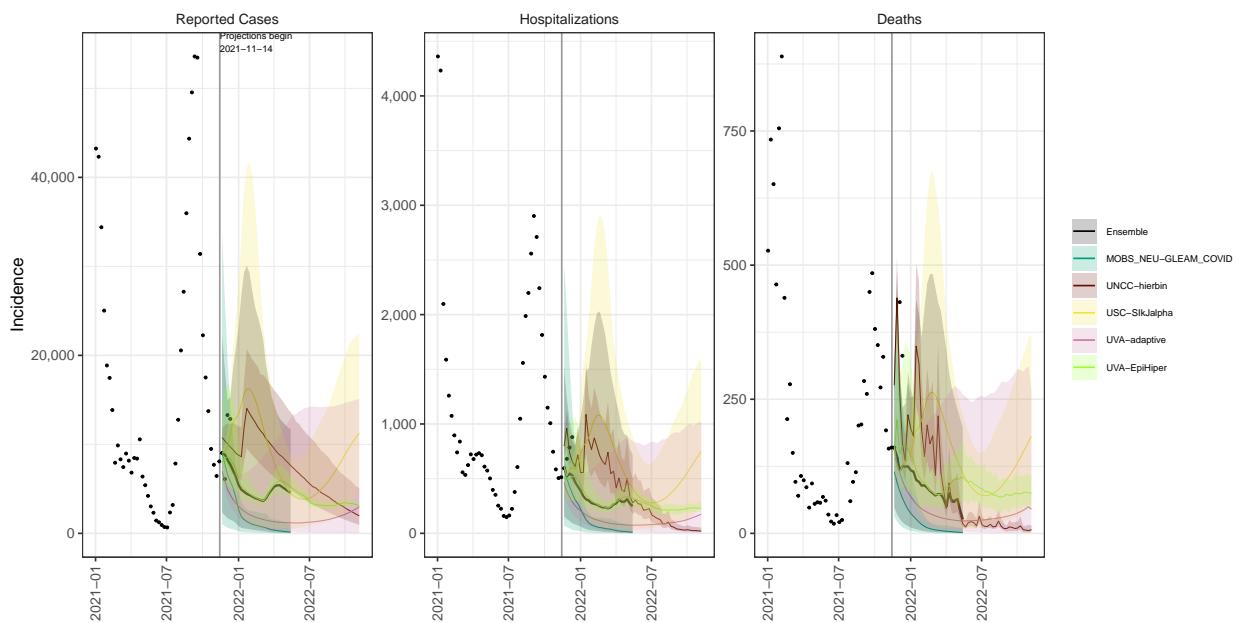
### SC model variance & 95% projection intervals – Optimistic waning, low booster coverage



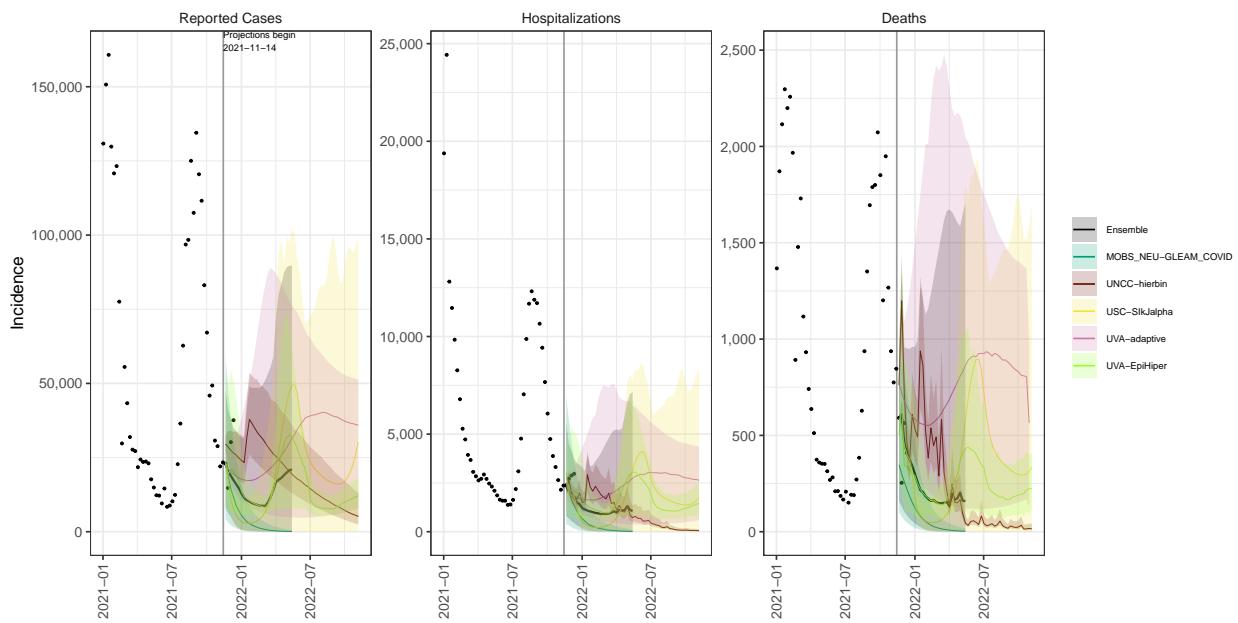
### SD model variance & 95% projection intervals – Optimistic waning, low booster coverage



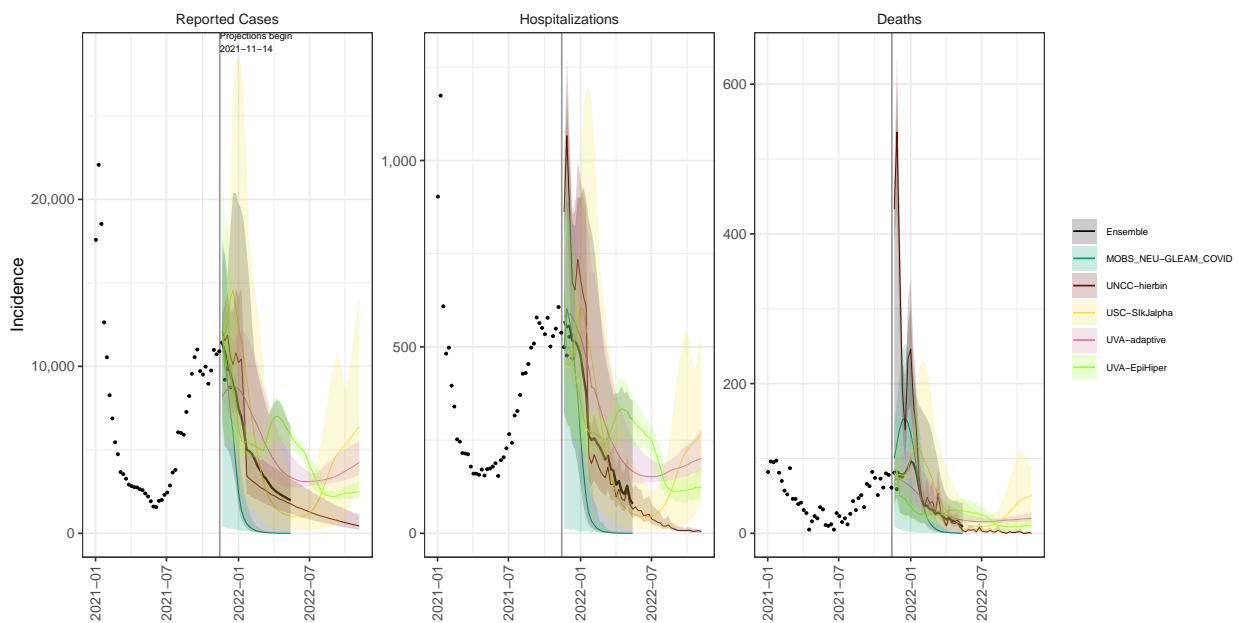
TN model variance & 95% projection intervals – Optimistic waning, low booster coverage



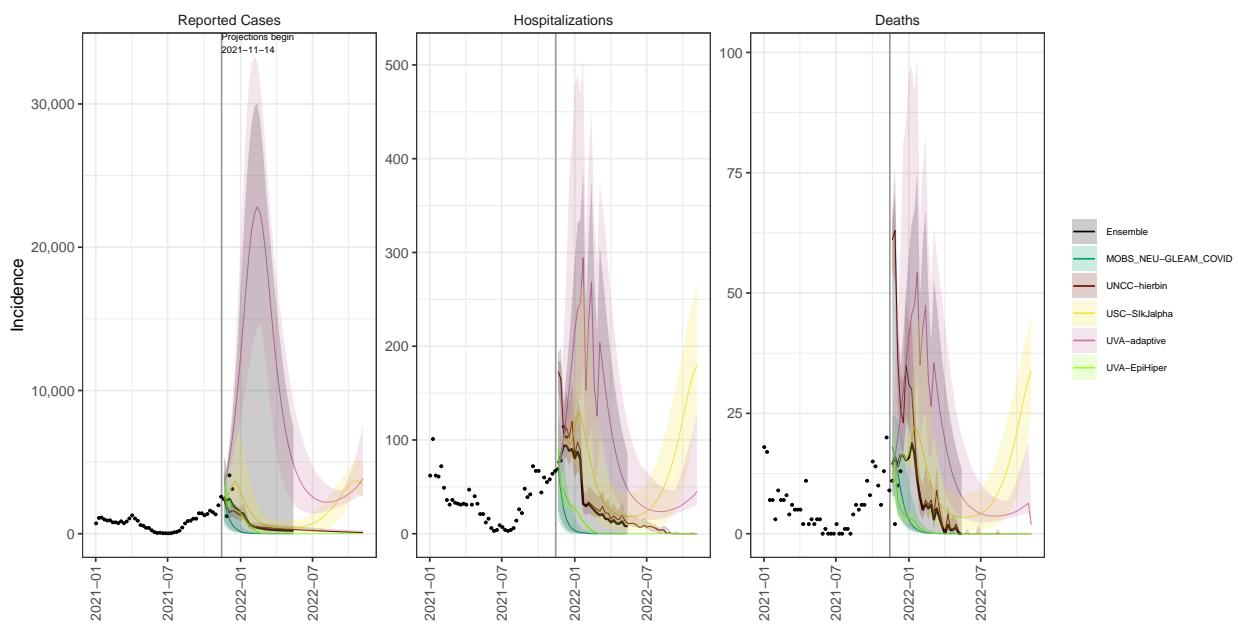
TX model variance & 95% projection intervals – Optimistic waning, low booster coverage



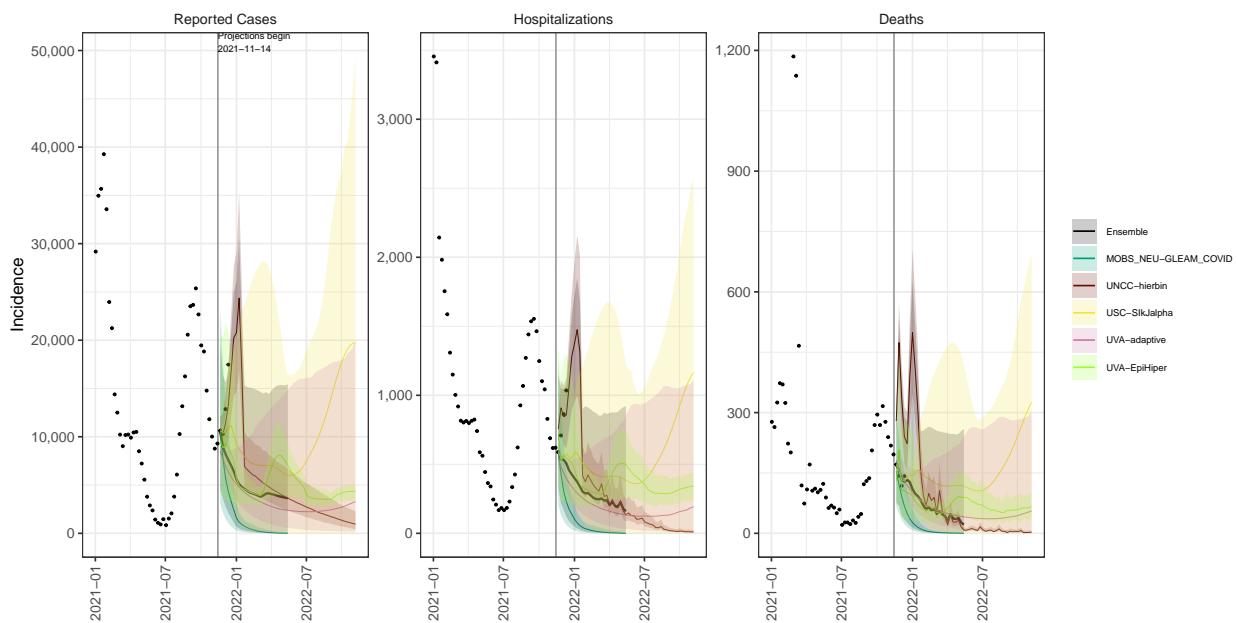
### UT model variance & 95% projection intervals – Optimistic waning, low booster coverage



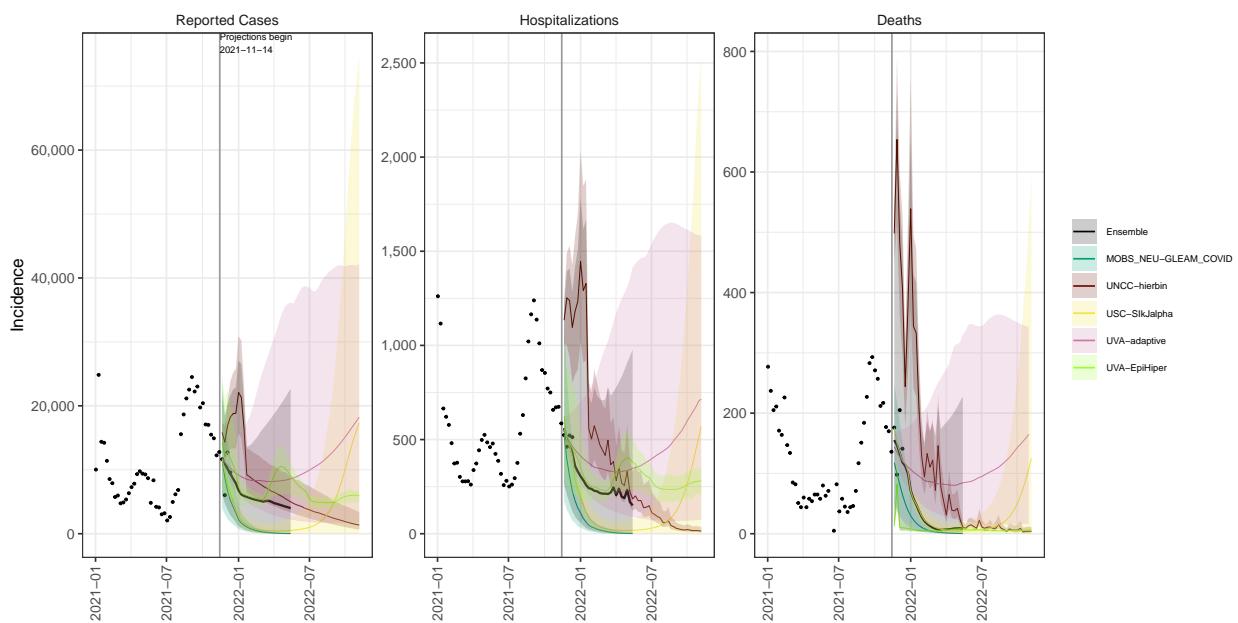
### VT model variance & 95% projection intervals – Optimistic waning, low booster coverage



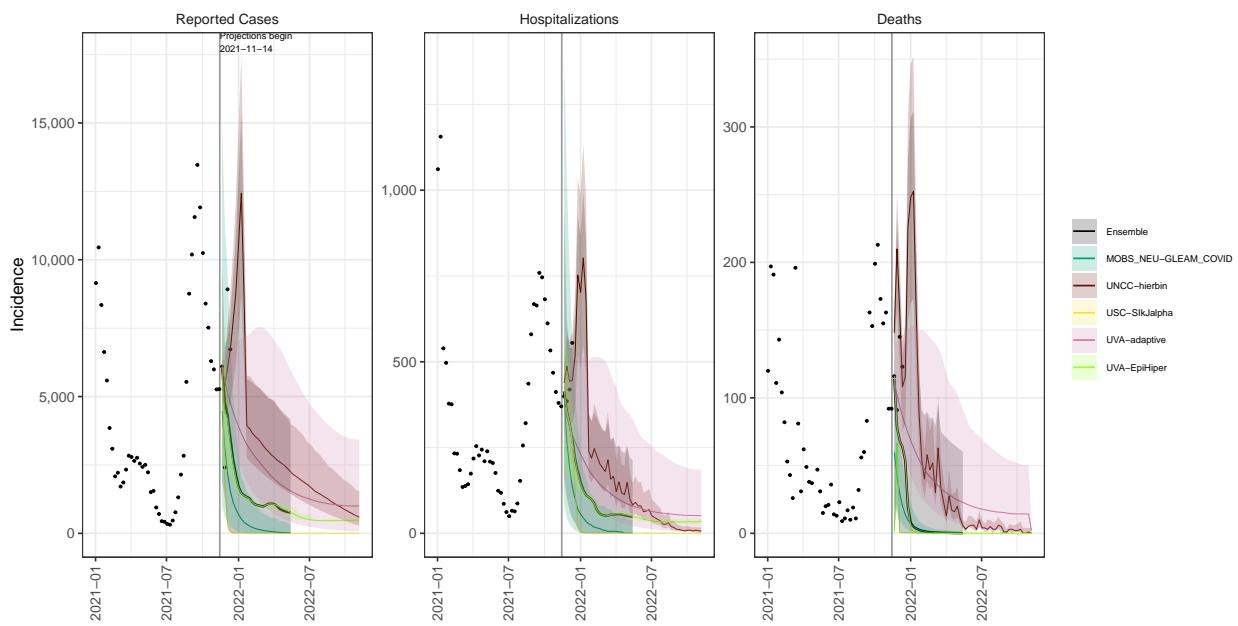
VA model variance & 95% projection intervals – Optimistic waning, low booster coverage



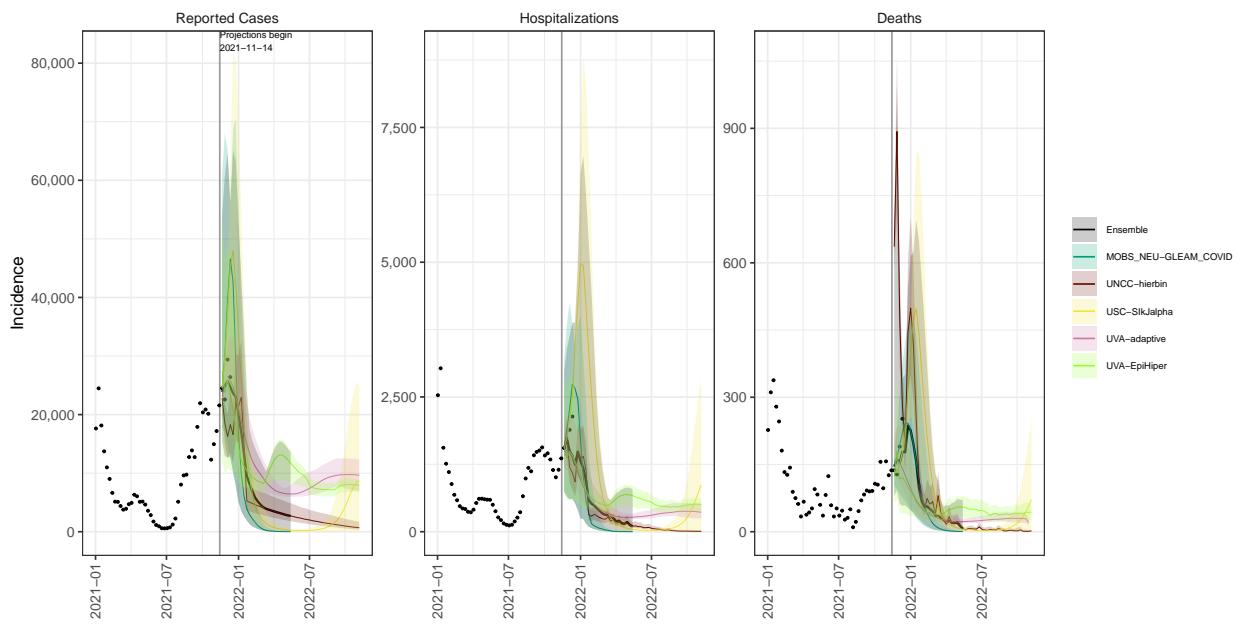
WA model variance & 95% projection intervals – Optimistic waning, low booster coverage



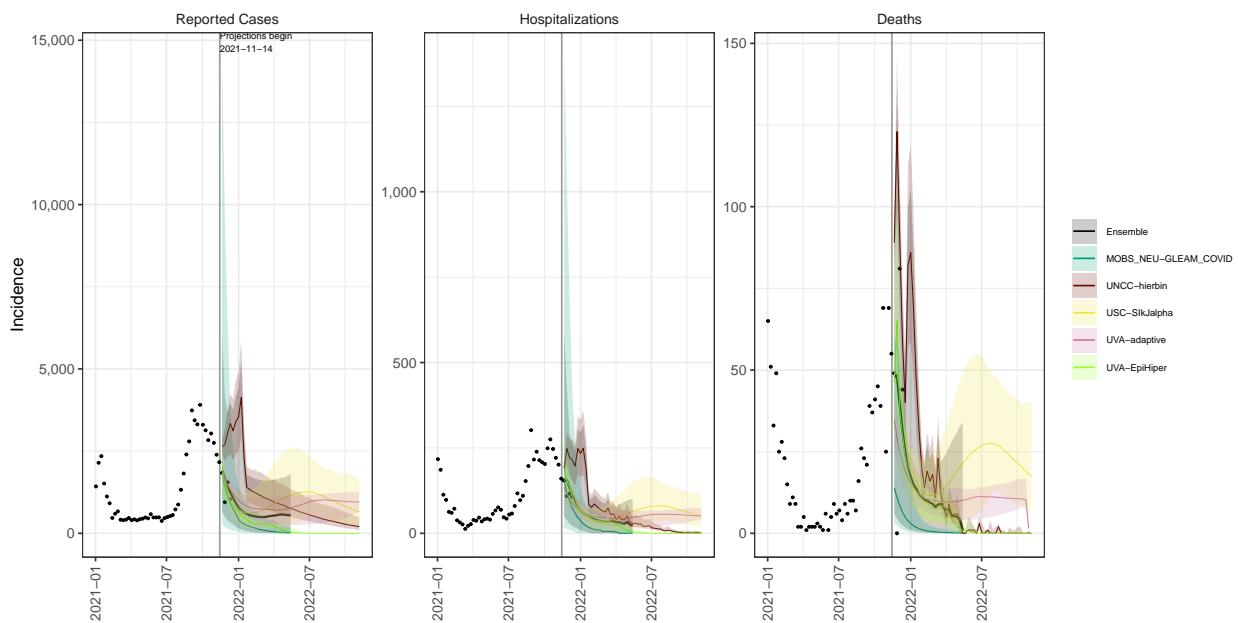
### WV model variance & 95% projection intervals – Optimistic waning, low booster coverage



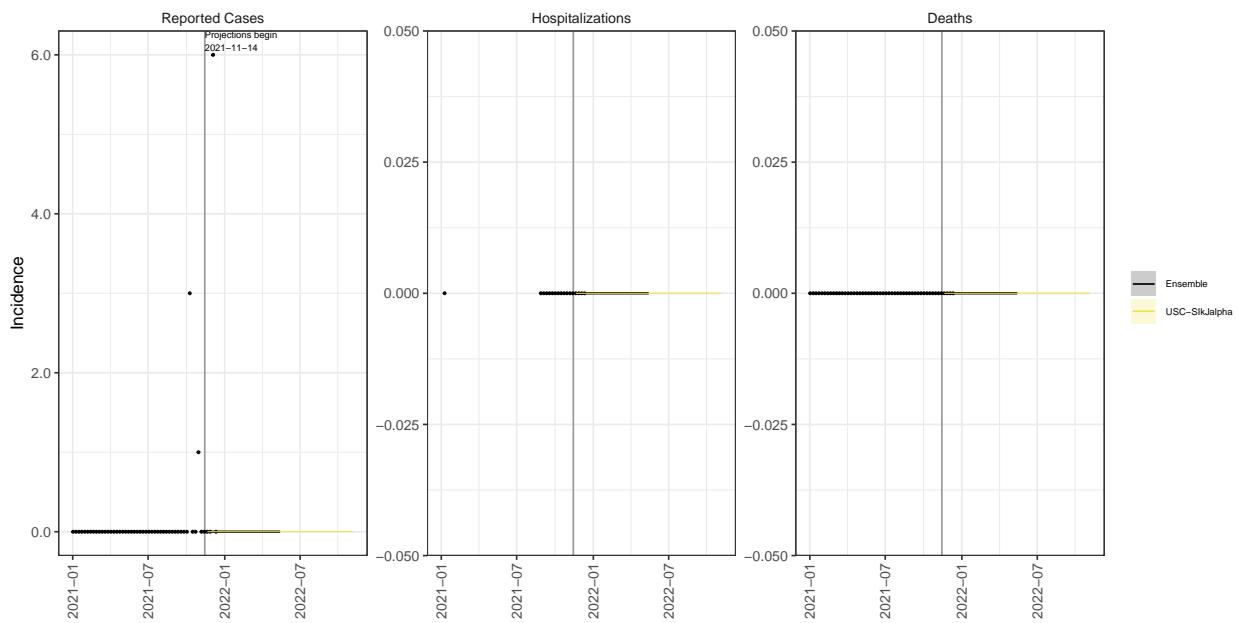
### WI model variance & 95% projection intervals – Optimistic waning, low booster coverage



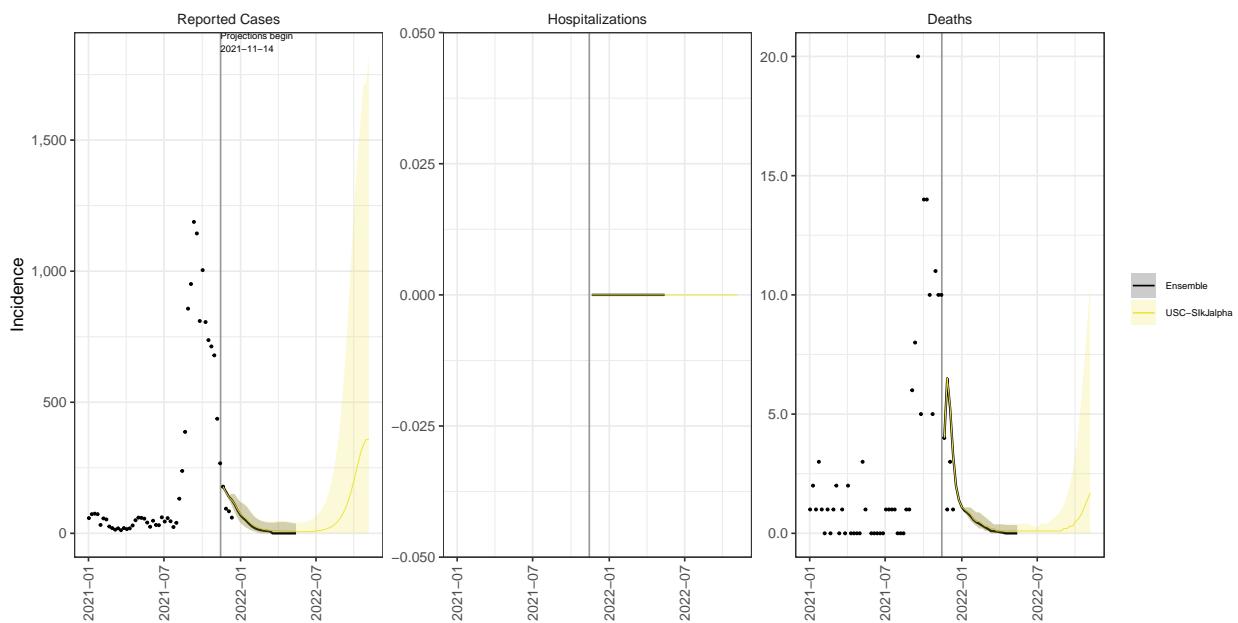
WY model variance & 95% projection intervals – Optimistic waning, low booster coverage



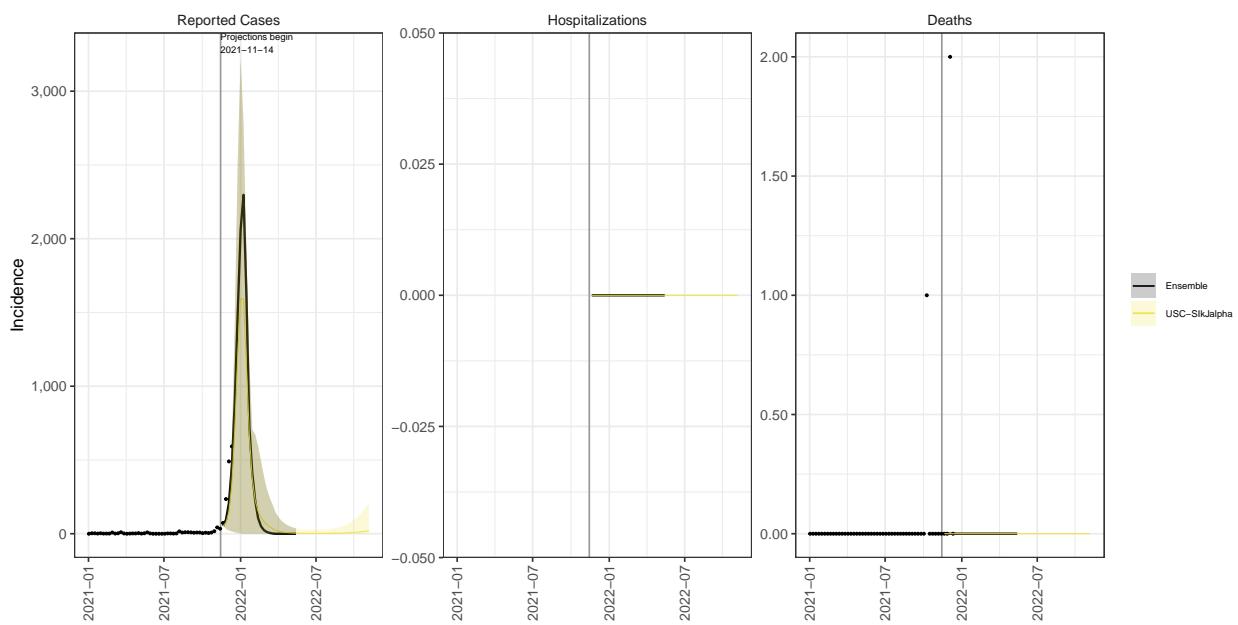
AS model variance & 95% projection intervals – Optimistic waning, low booster coverage



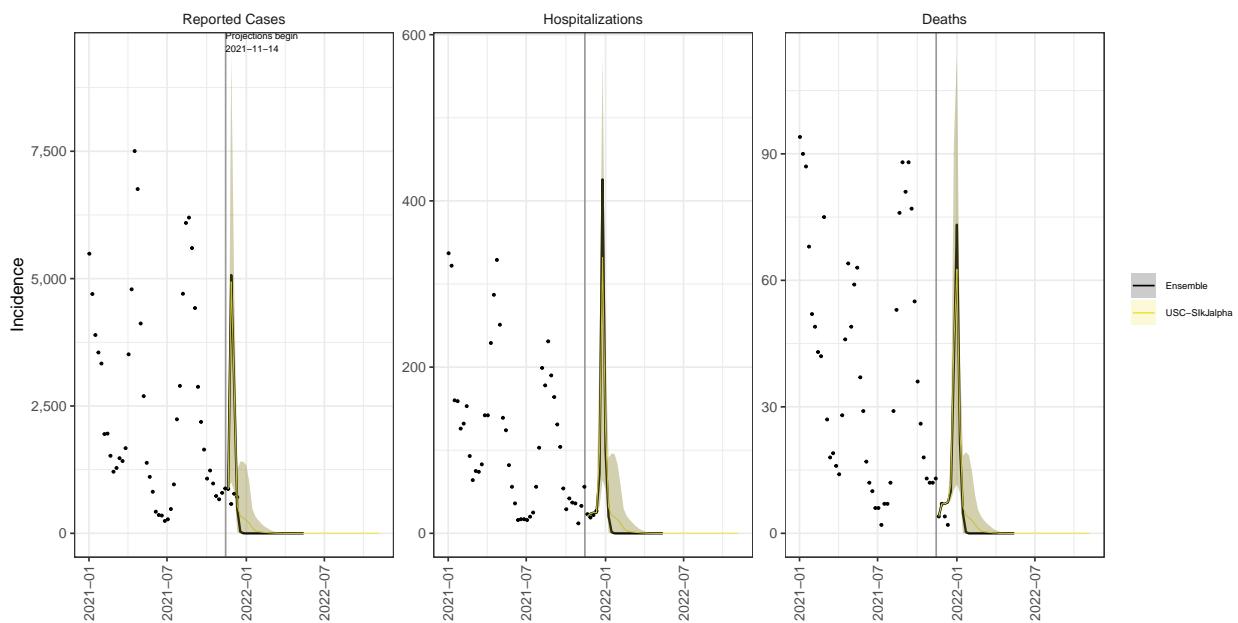
### GU model variance & 95% projection intervals – Optimistic waning, low booster coverage



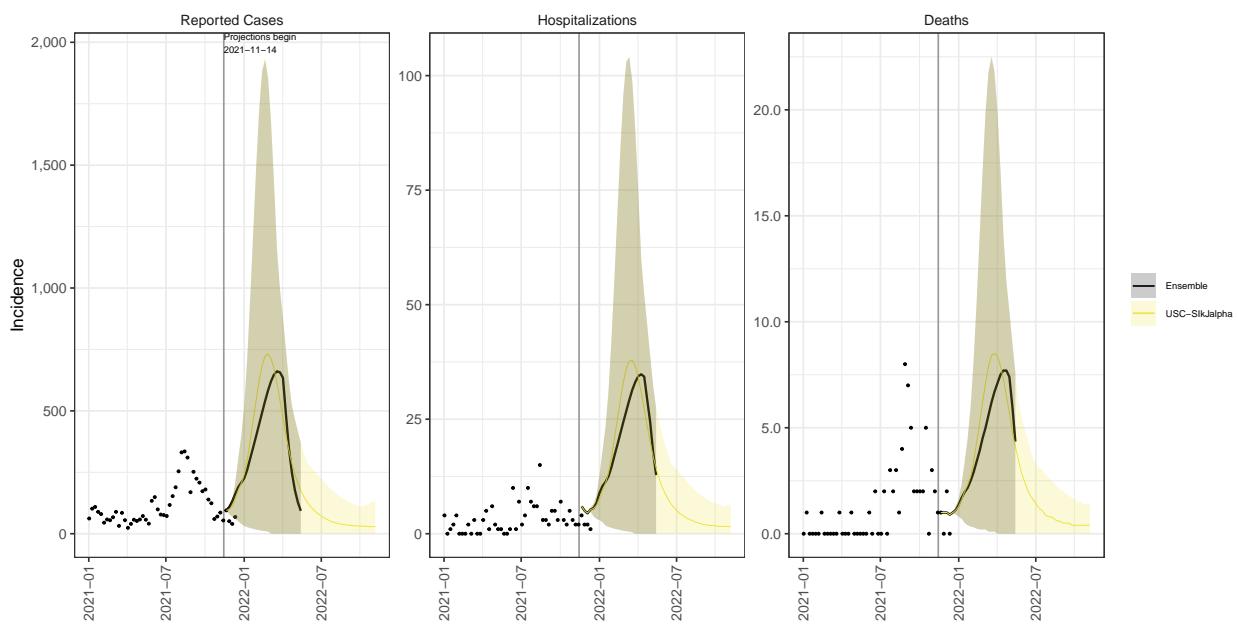
### MP model variance & 95% projection intervals – Optimistic waning, low booster coverage



PR model variance & 95% projection intervals – Optimistic waning, low booster coverage

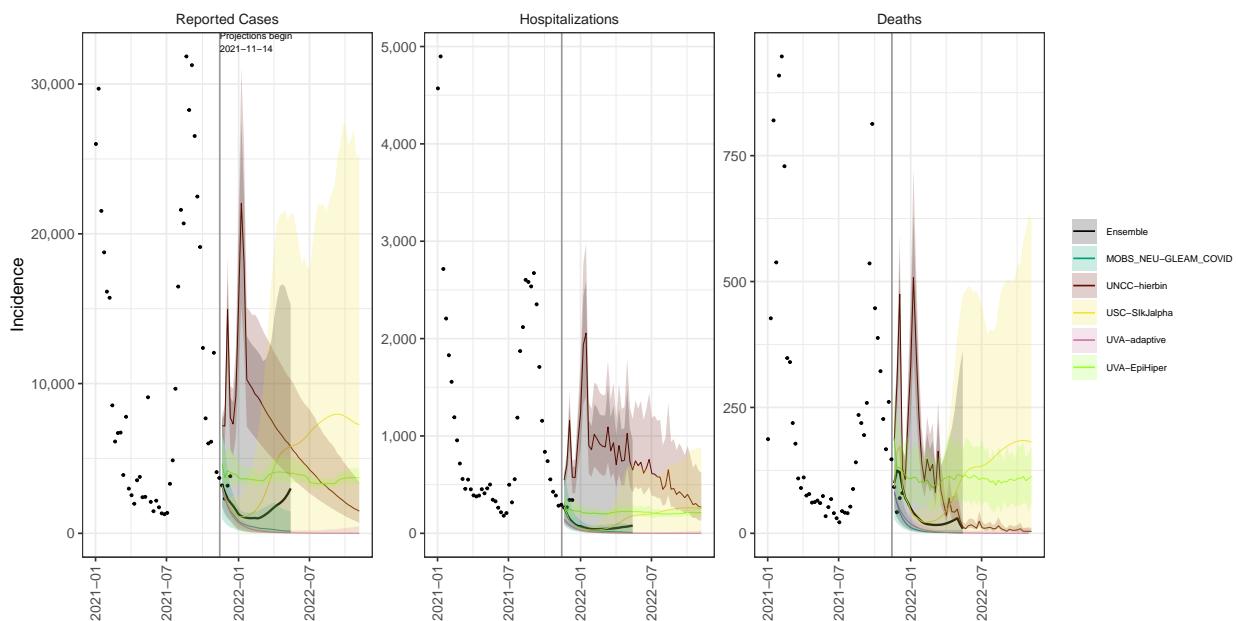


VI model variance & 95% projection intervals – Optimistic waning, low booster coverage

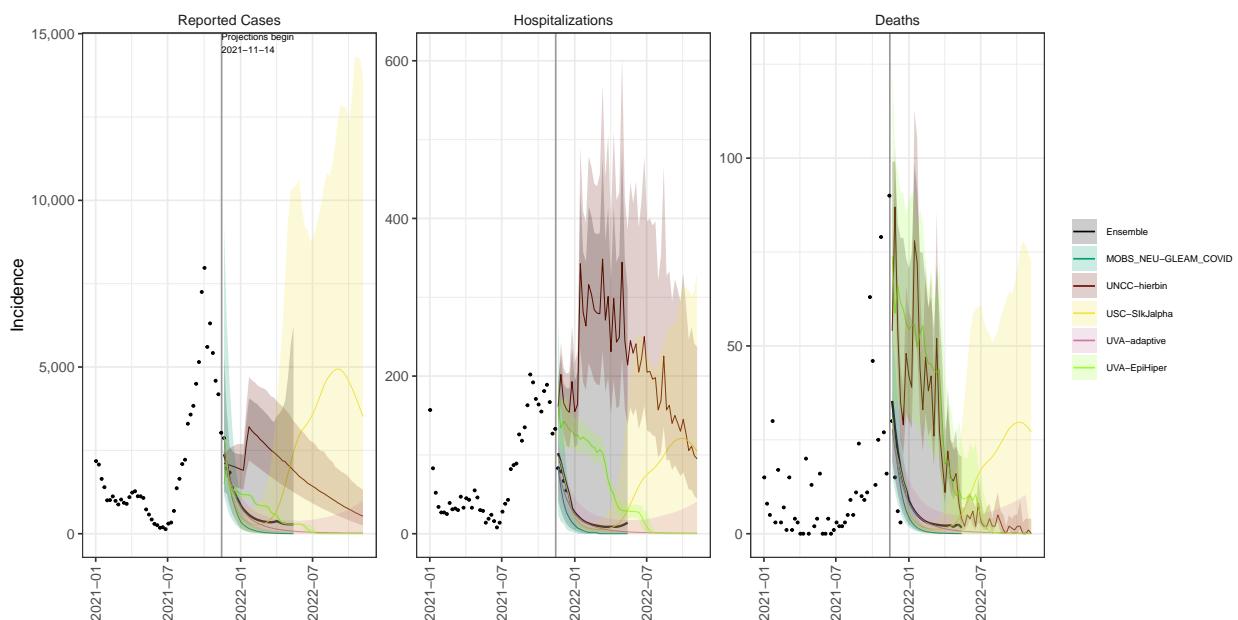


National model variation for the pessimistic waning, low booster coverage scenario.

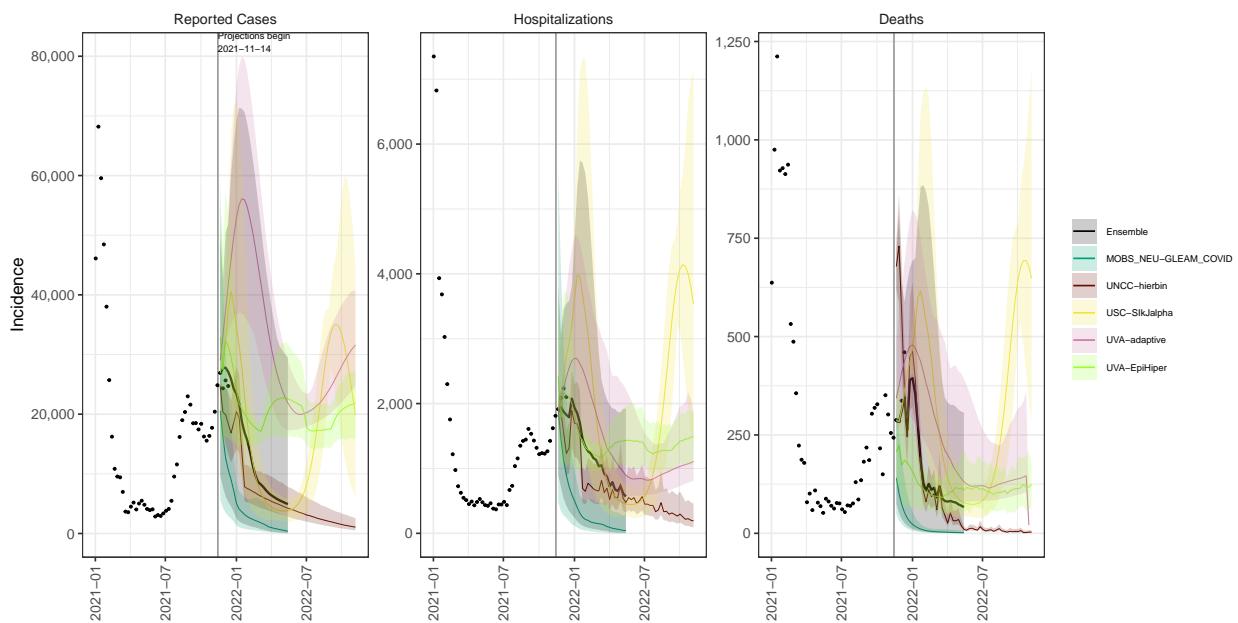
AL model variance & 95% projection intervals – Pessimistic waning, low booster coverage



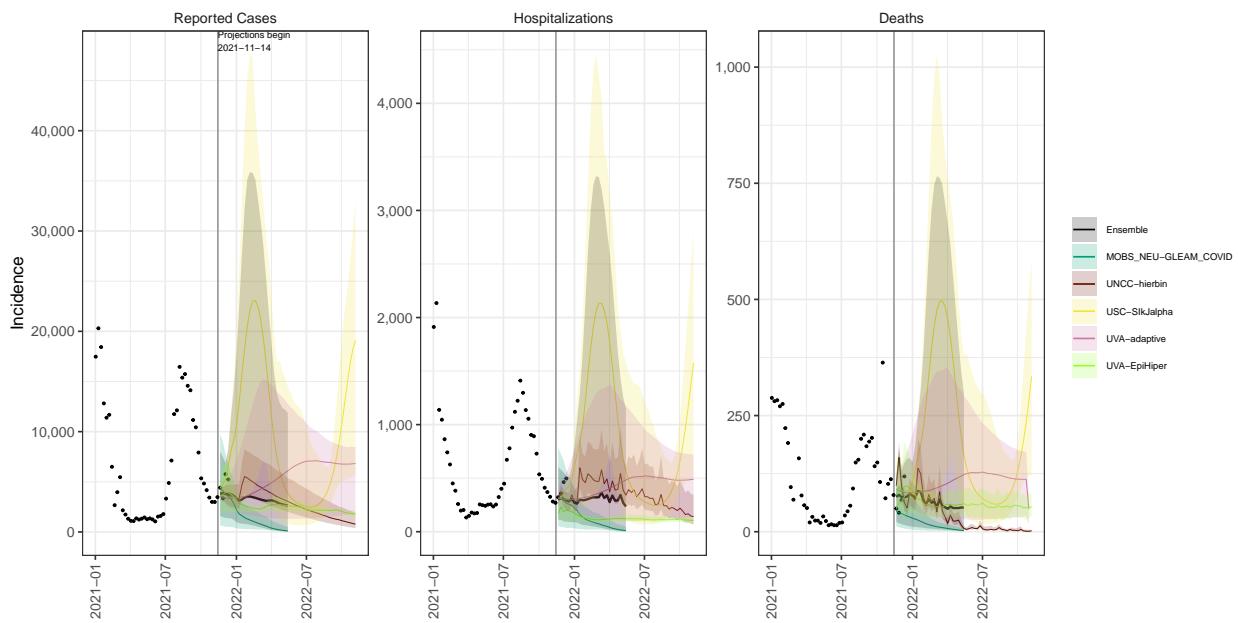
AK model variance & 95% projection intervals – Pessimistic waning, low booster coverage



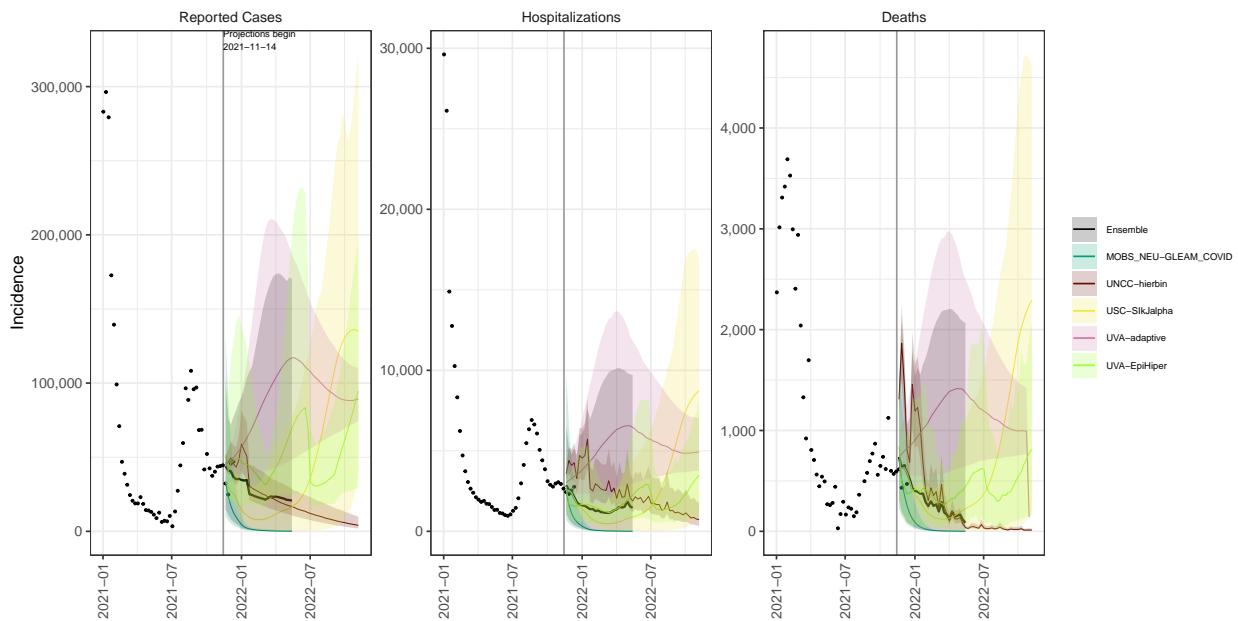
AZ model variance & 95% projection intervals – Pessimistic waning, low booster coverage



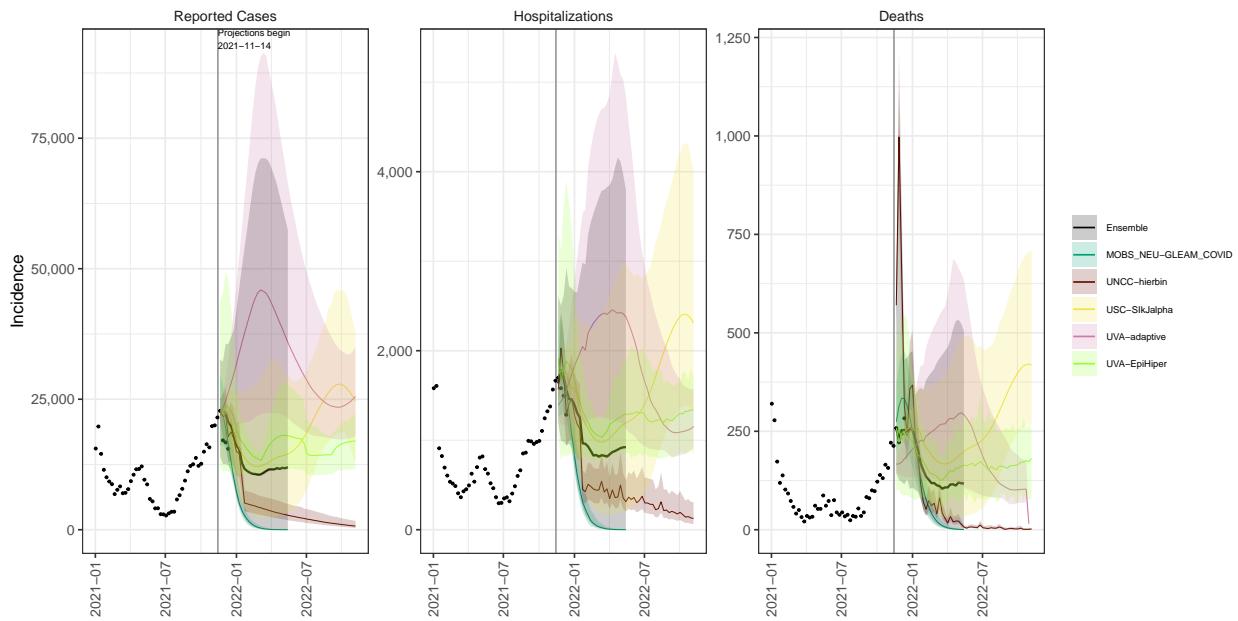
AR model variance & 95% projection intervals – Pessimistic waning, low booster coverage



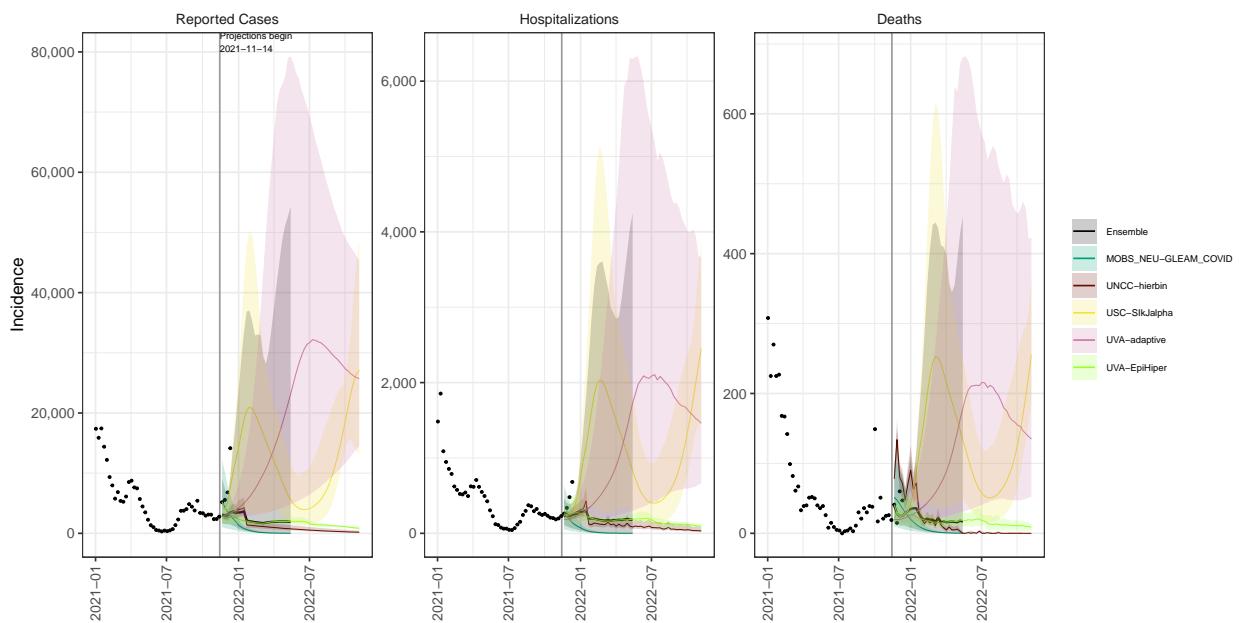
### CA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



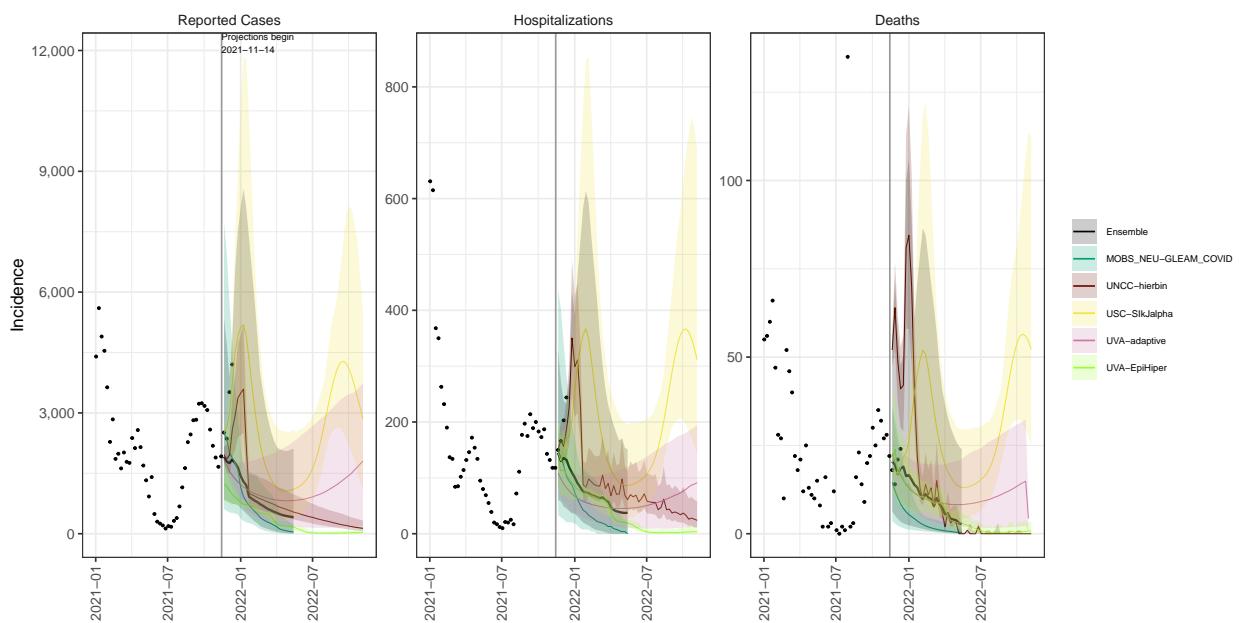
### CO model variance & 95% projection intervals – Pessimistic waning, low booster coverage



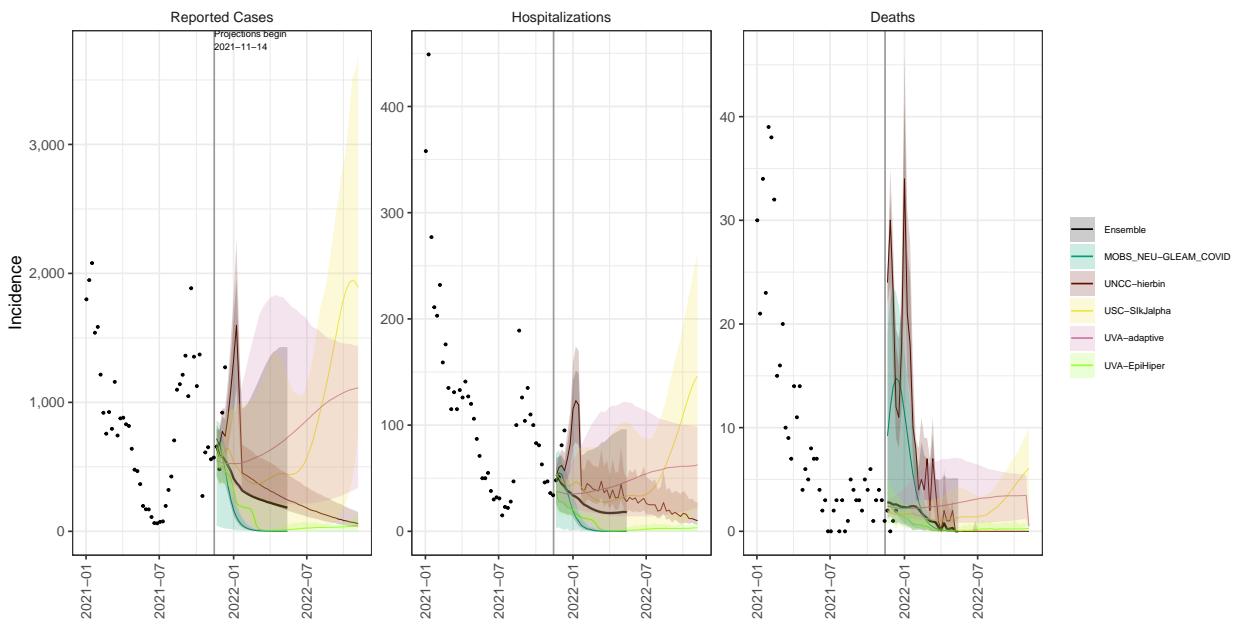
### CT model variance & 95% projection intervals – Pessimistic waning, low booster coverage



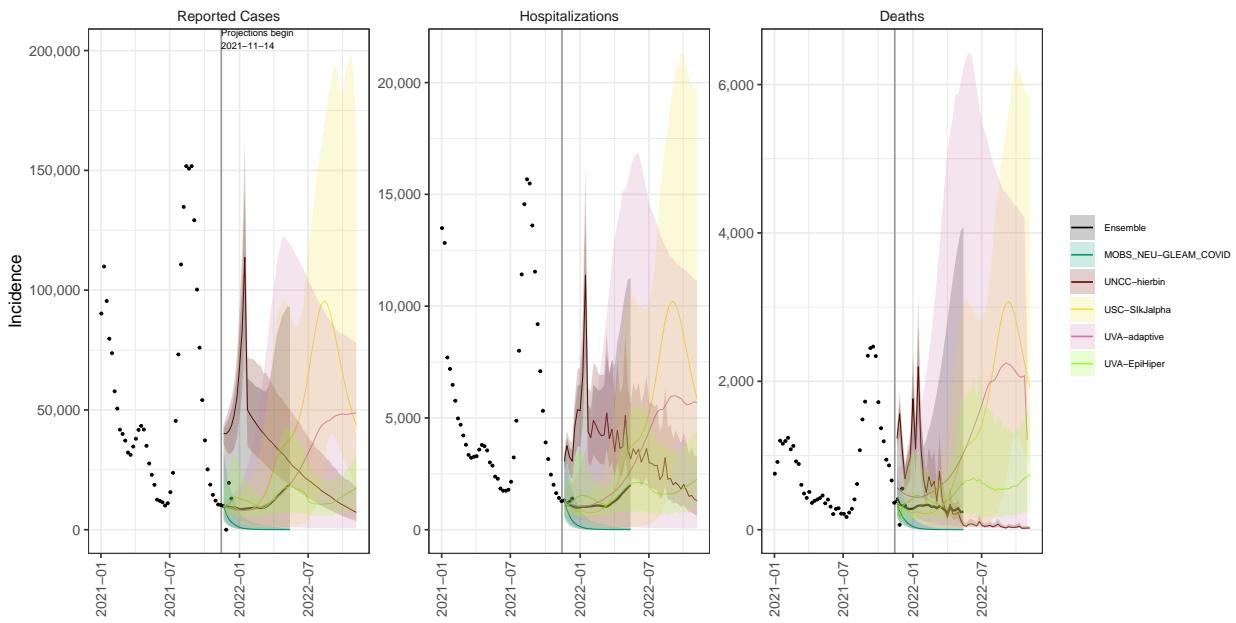
### DE model variance & 95% projection intervals – Pessimistic waning, low booster coverage



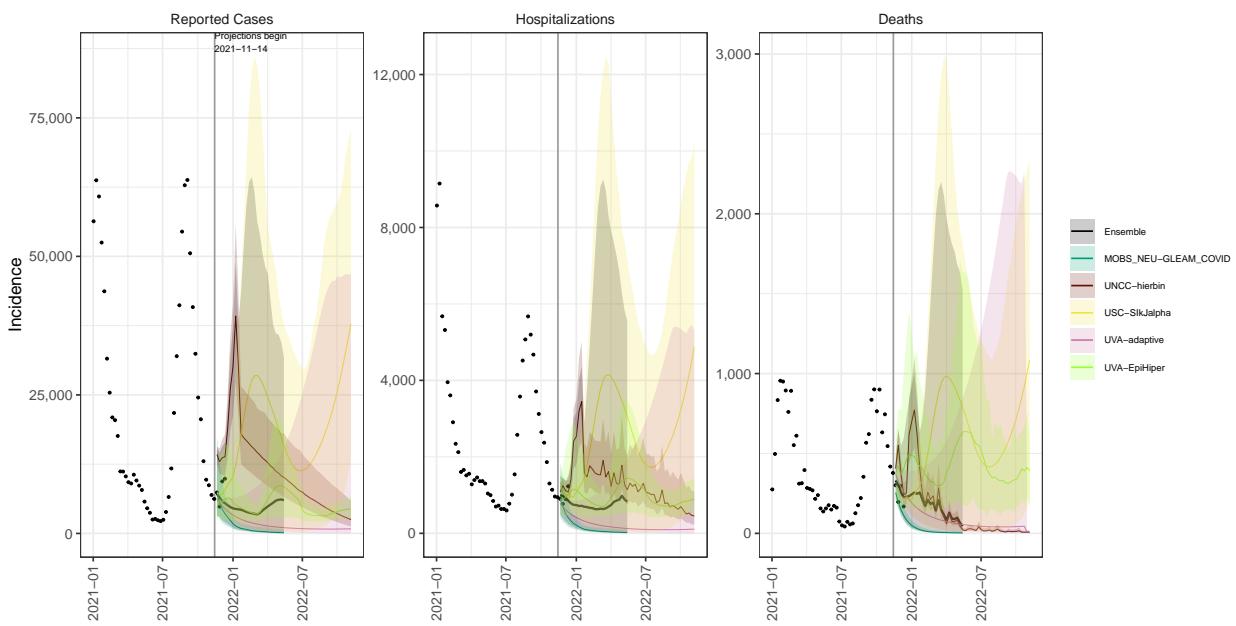
DC model variance & 95% projection intervals – Pessimistic waning, low booster coverage



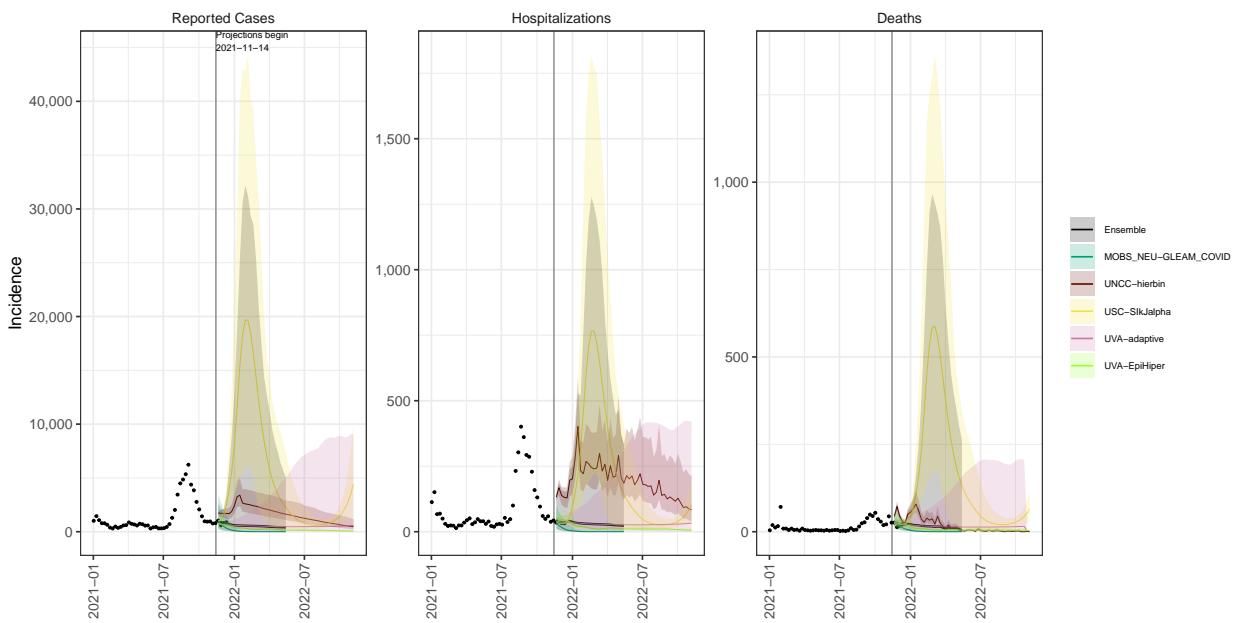
FL model variance & 95% projection intervals – Pessimistic waning, low booster coverage



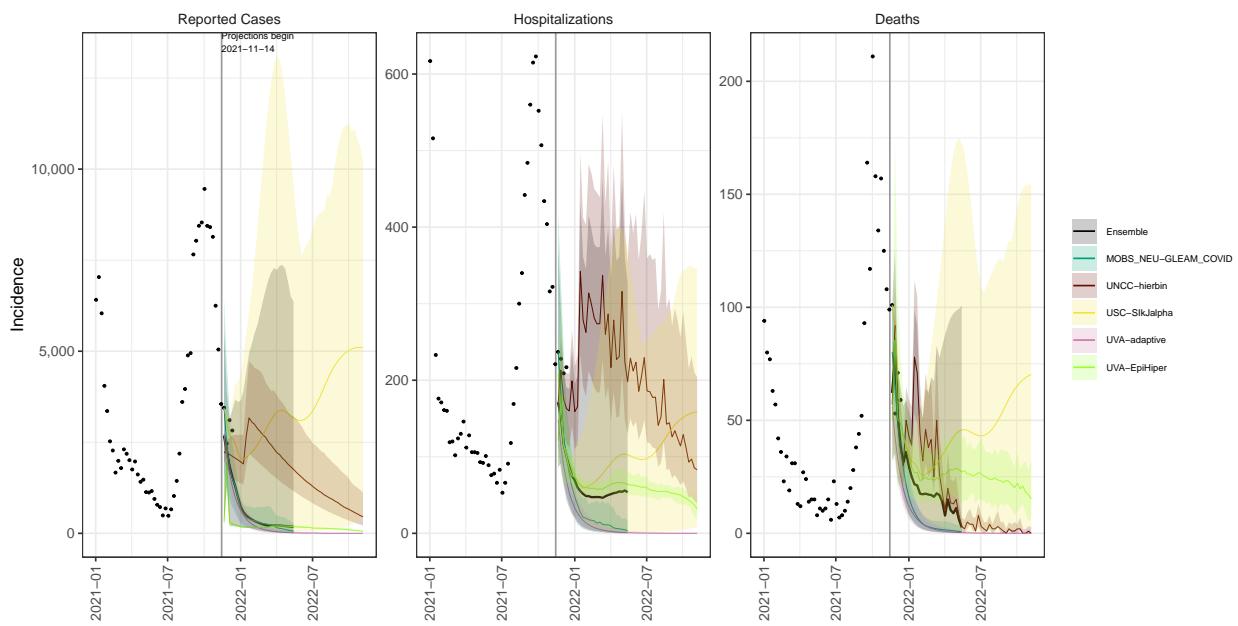
GA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



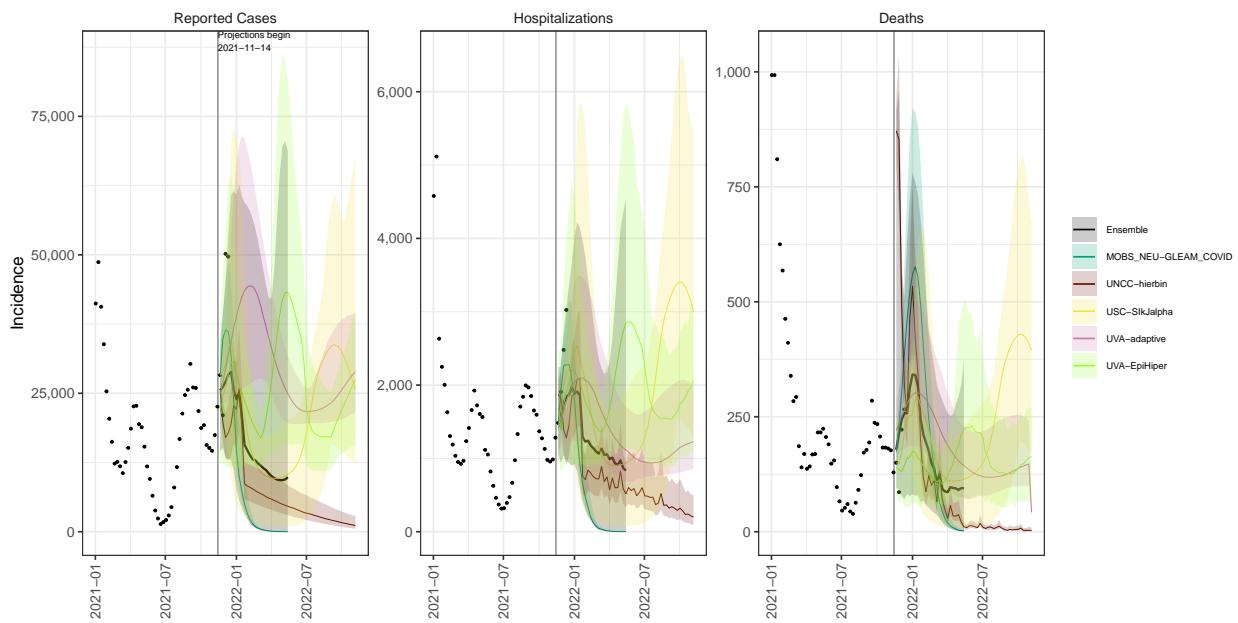
HI model variance & 95% projection intervals – Pessimistic waning, low booster coverage



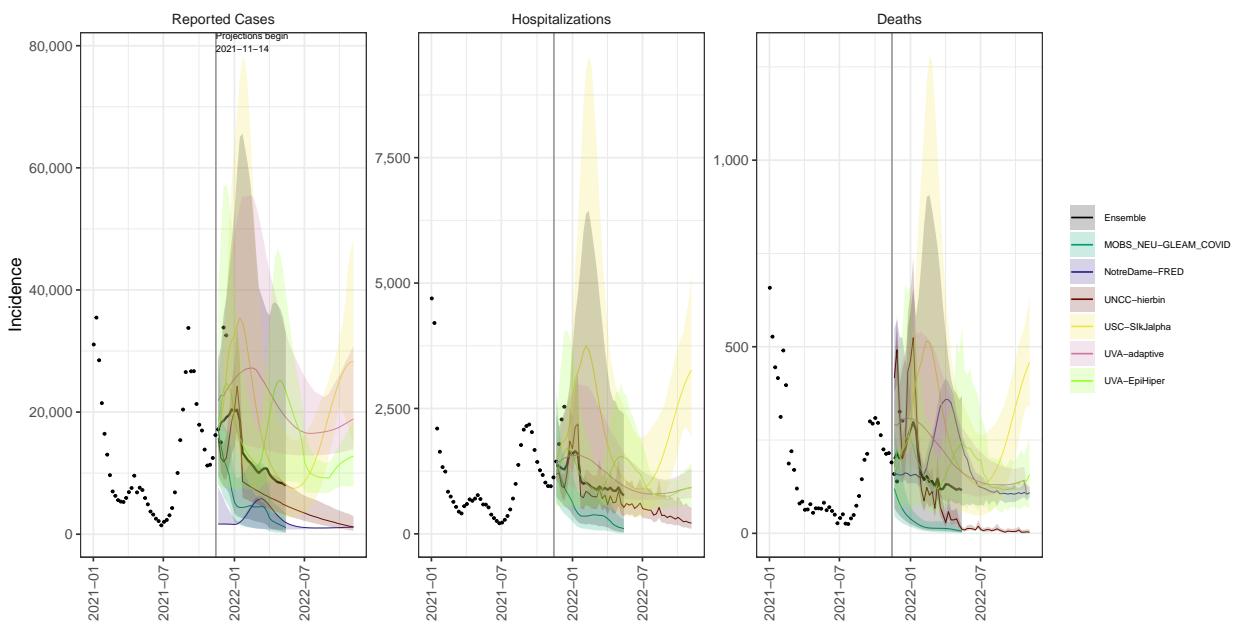
ID model variance & 95% projection intervals – Pessimistic waning, low booster coverage



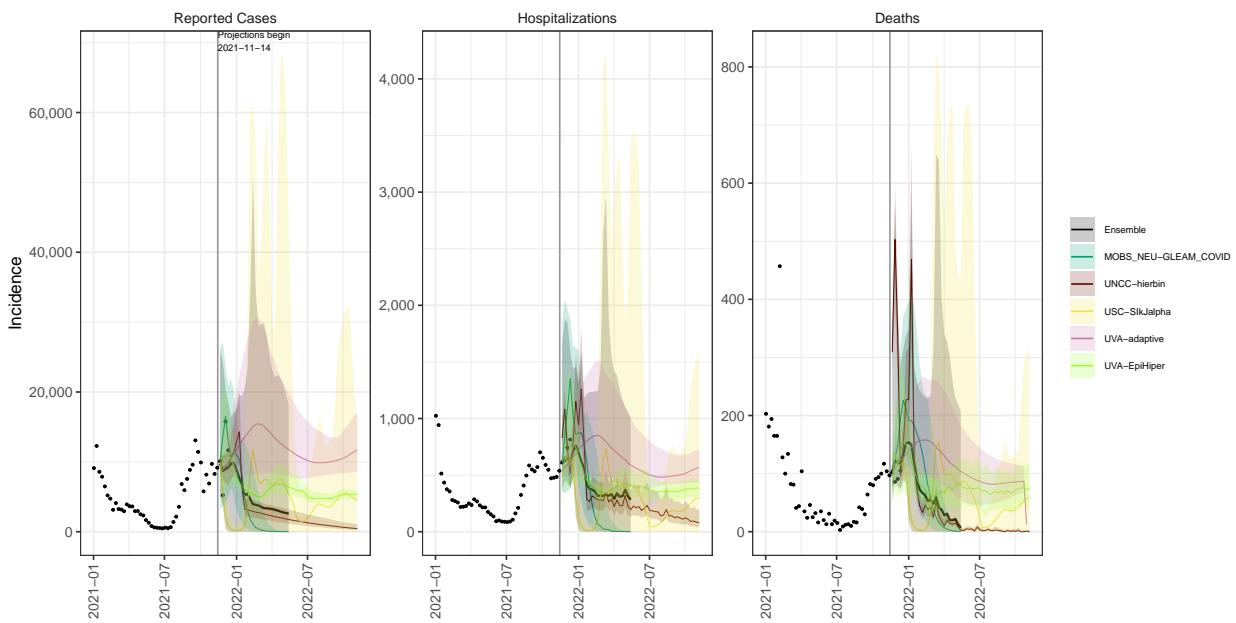
IL model variance & 95% projection intervals – Pessimistic waning, low booster coverage



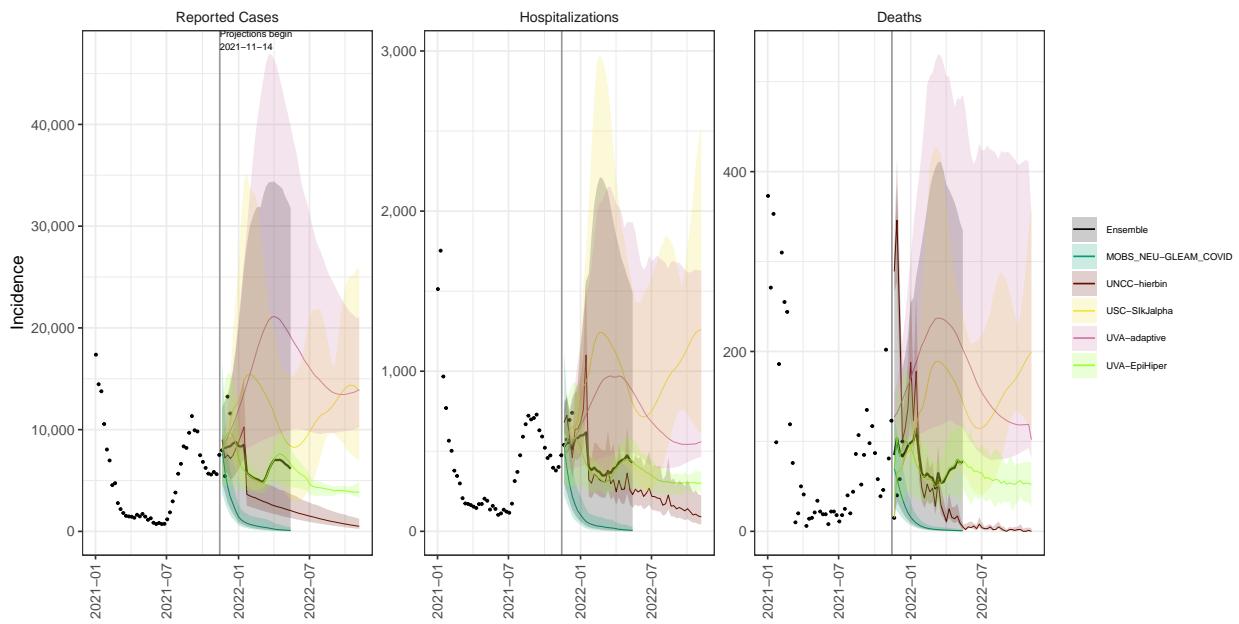
IN model variance & 95% projection intervals – Pessimistic waning, low booster coverage



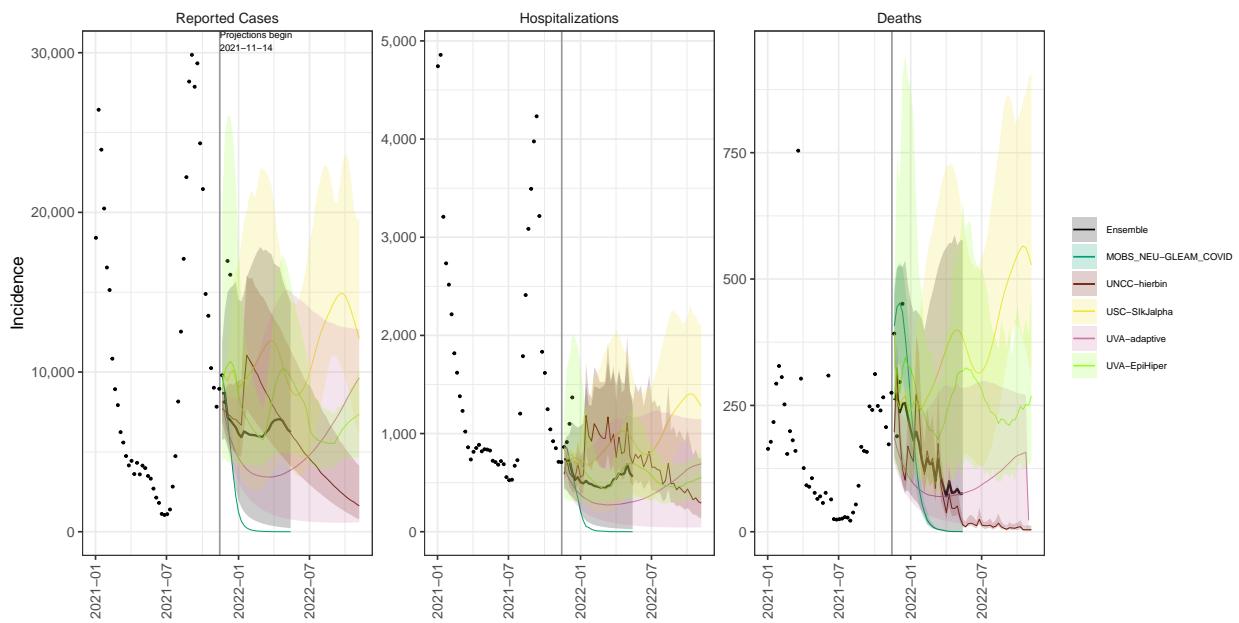
IA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



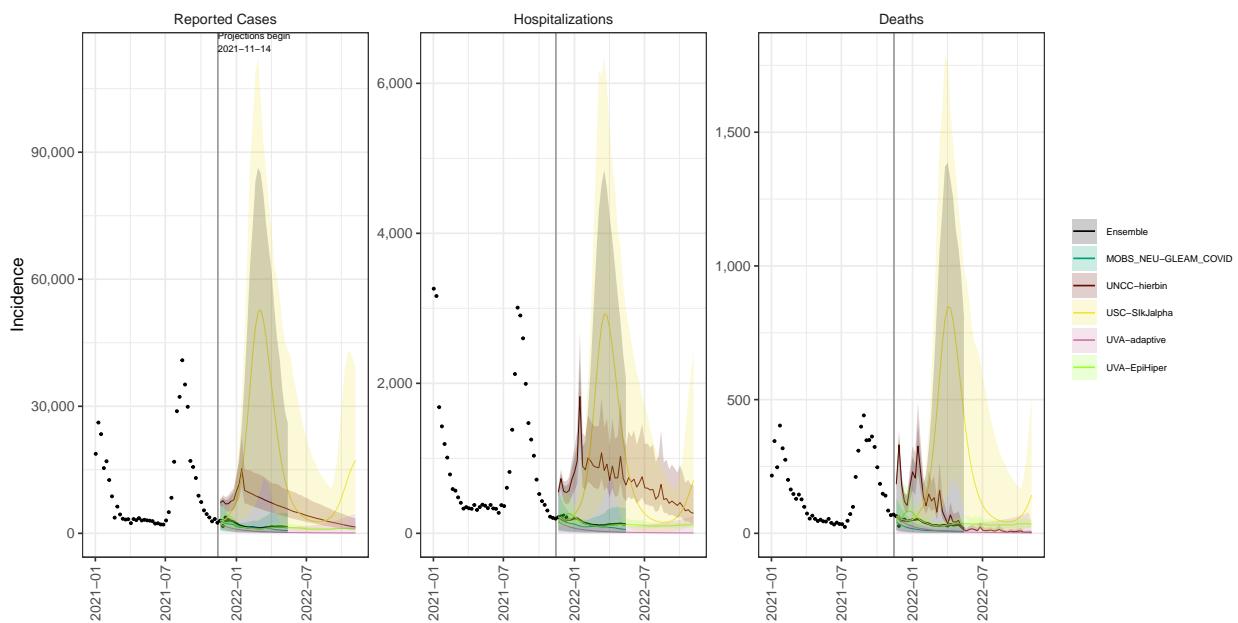
KS model variance & 95% projection intervals – Pessimistic waning, low booster coverage



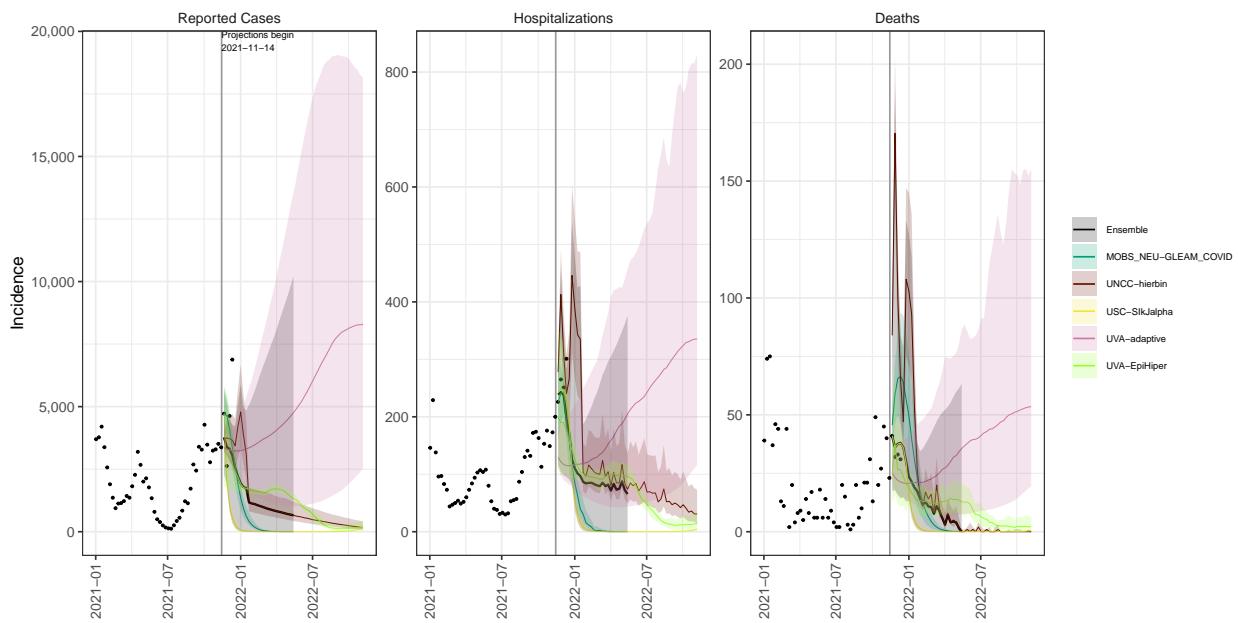
KY model variance & 95% projection intervals – Pessimistic waning, low booster coverage



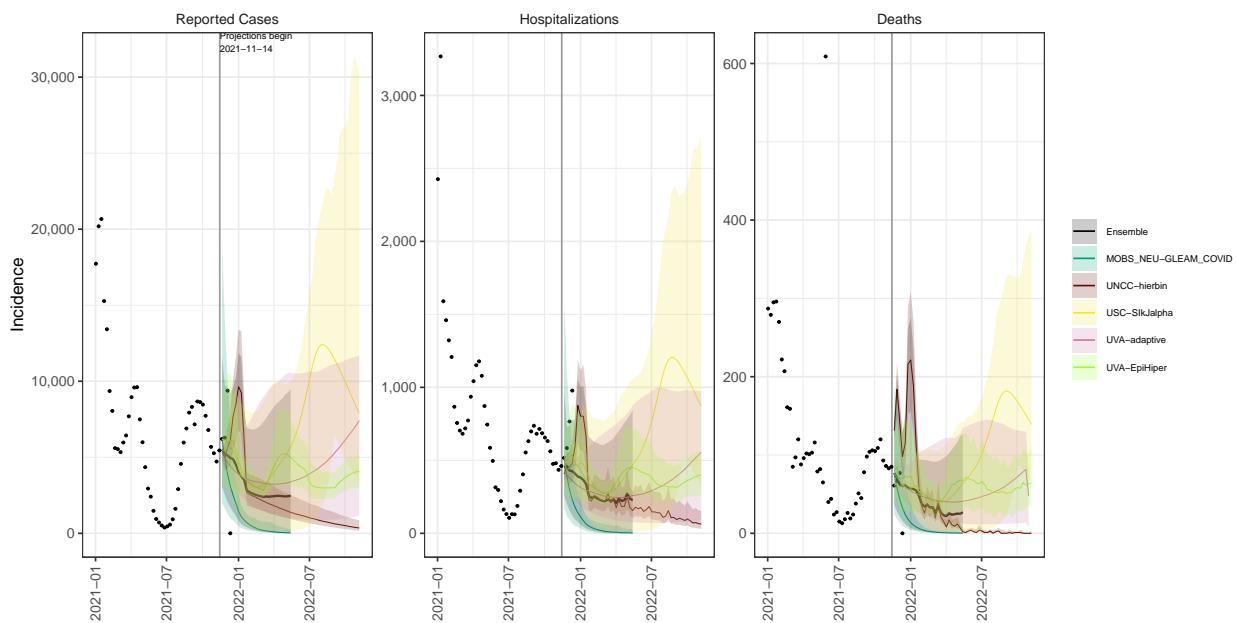
LA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



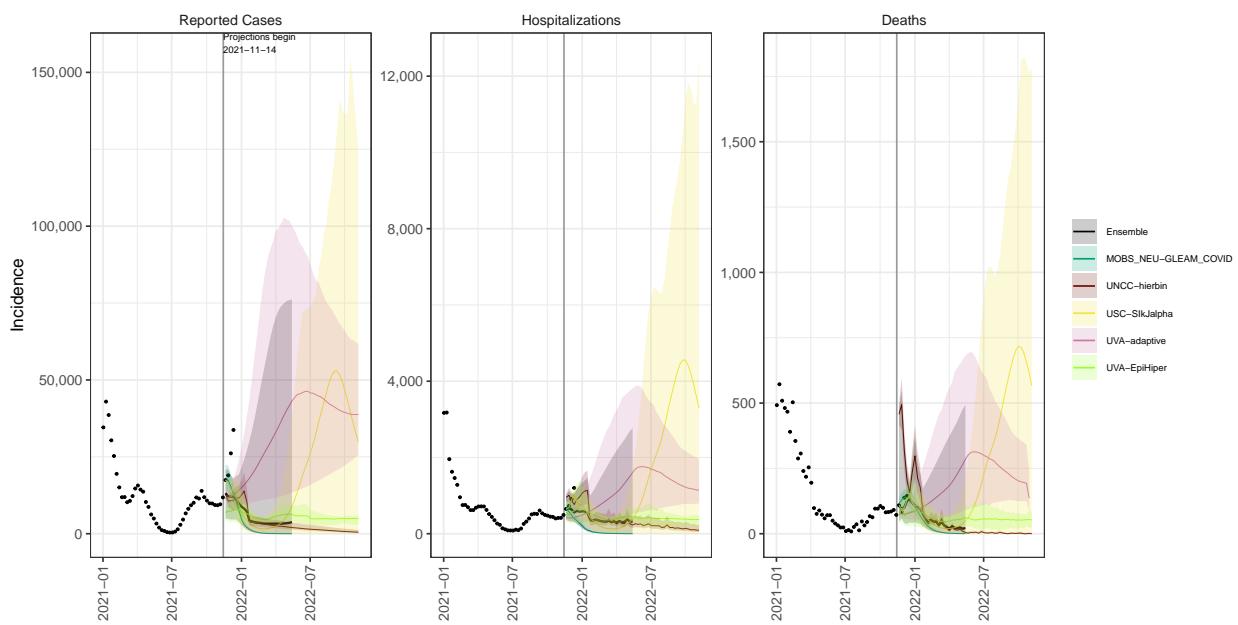
ME model variance & 95% projection intervals – Pessimistic waning, low booster coverage



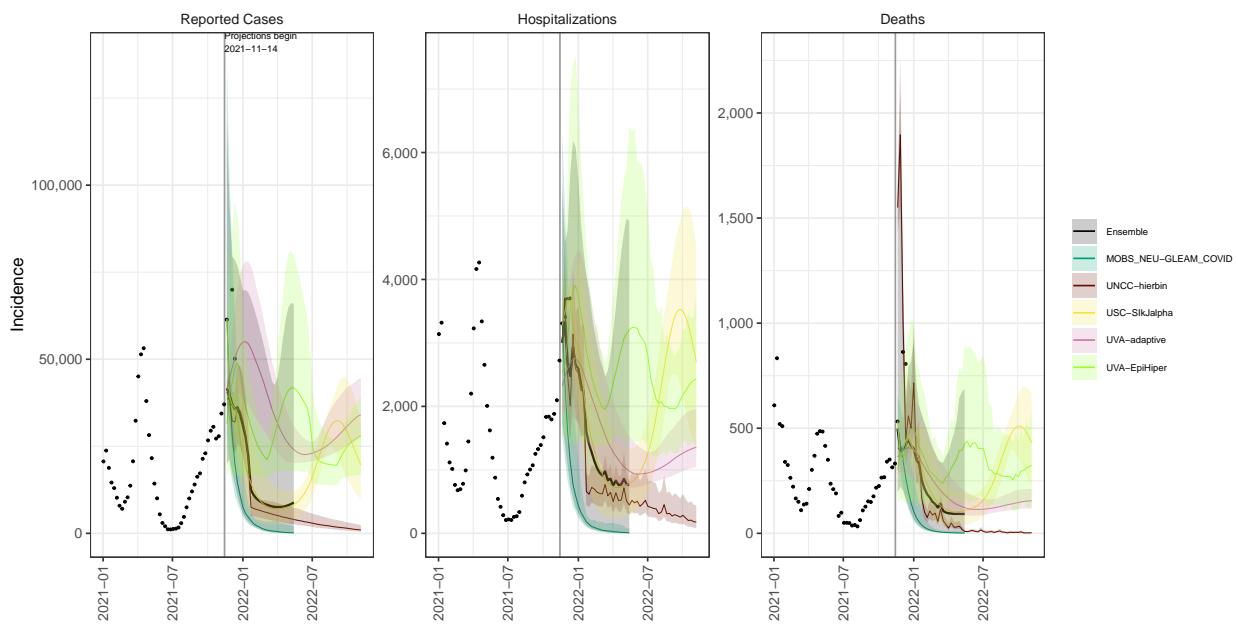
MD model variance & 95% projection intervals – Pessimistic waning, low booster coverage



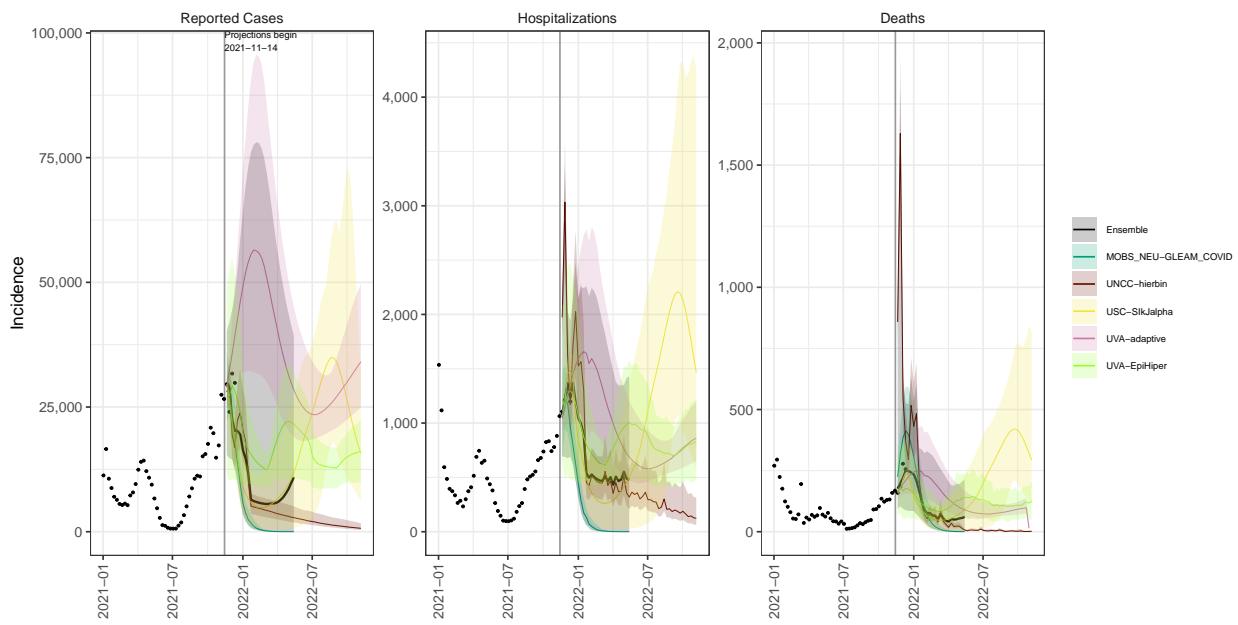
MA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



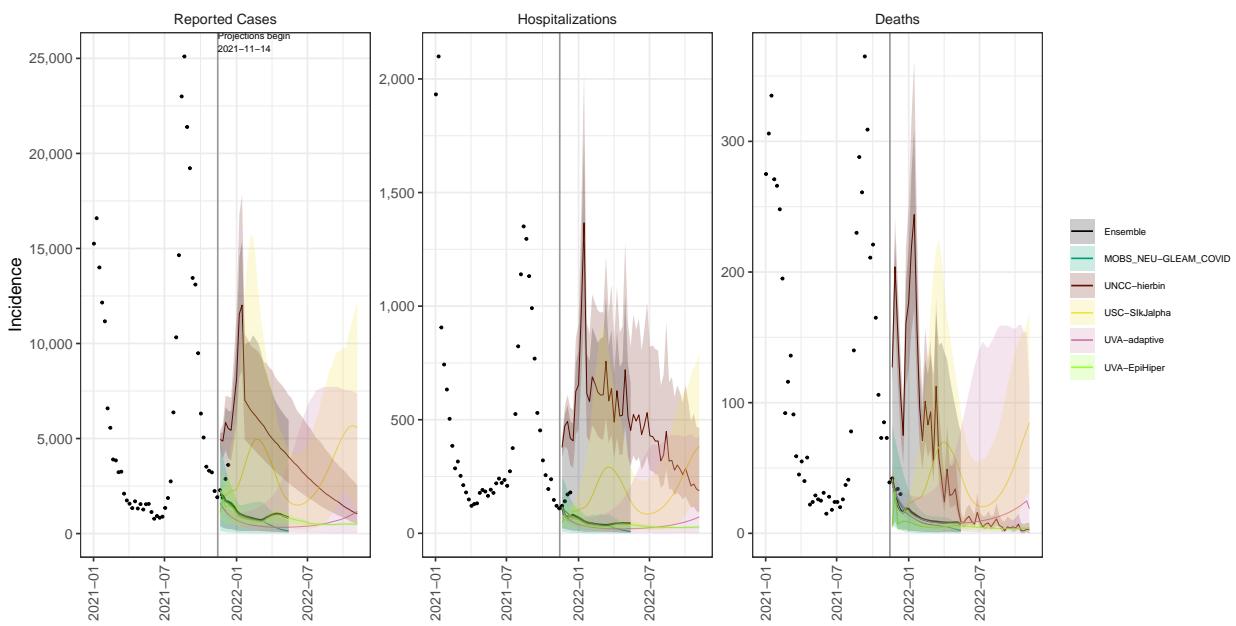
MI model variance & 95% projection intervals – Pessimistic waning, low booster coverage



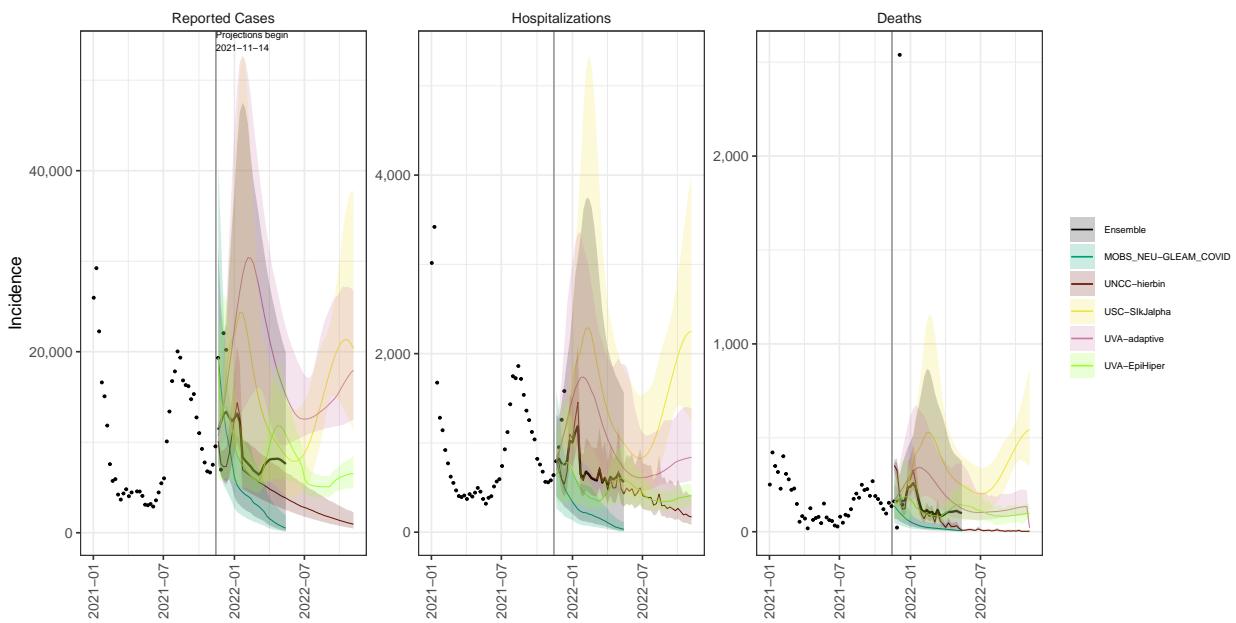
MN model variance & 95% projection intervals – Pessimistic waning, low booster coverage



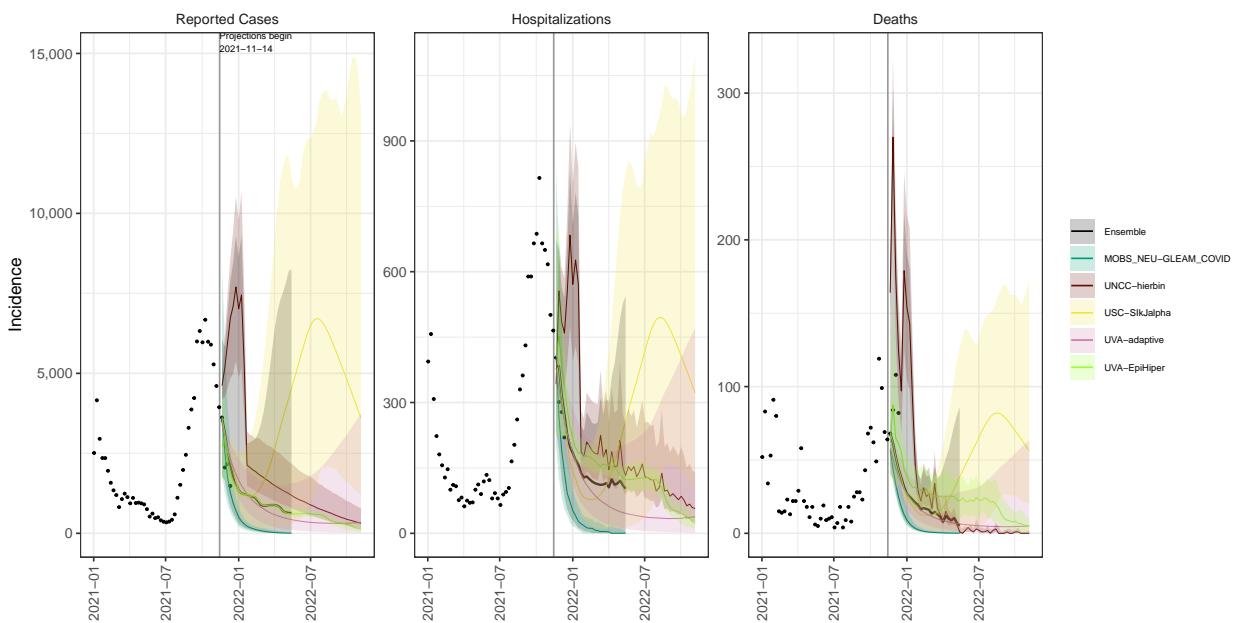
MS model variance & 95% projection intervals – Pessimistic waning, low booster coverage



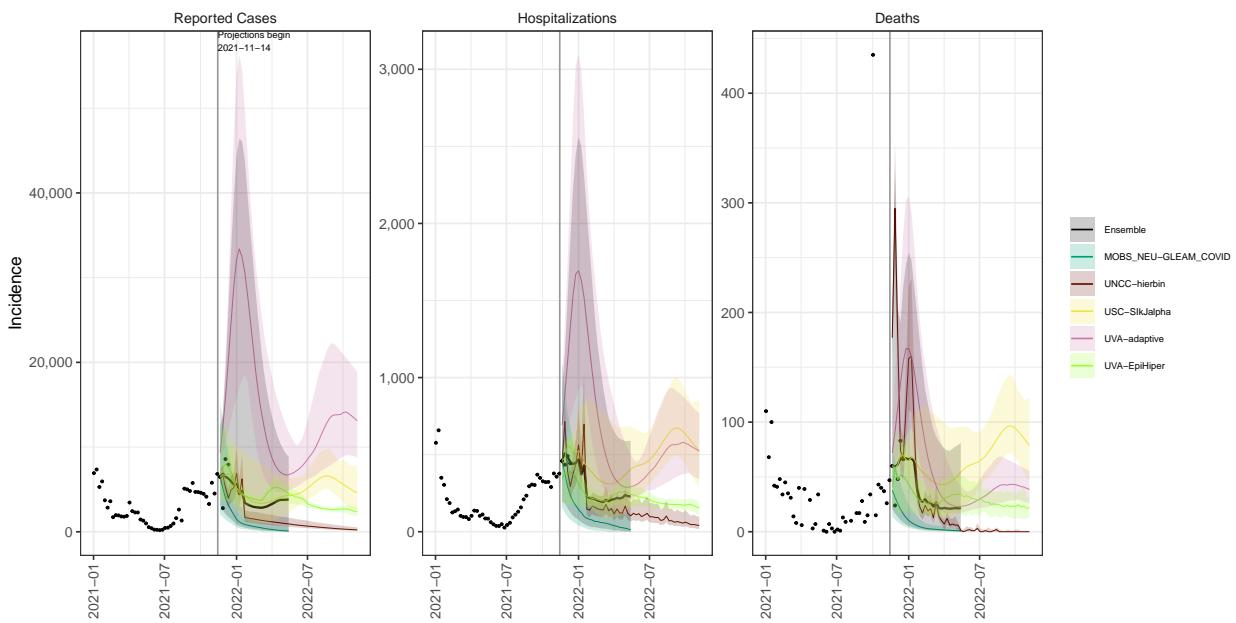
MO model variance & 95% projection intervals – Pessimistic waning, low booster coverage



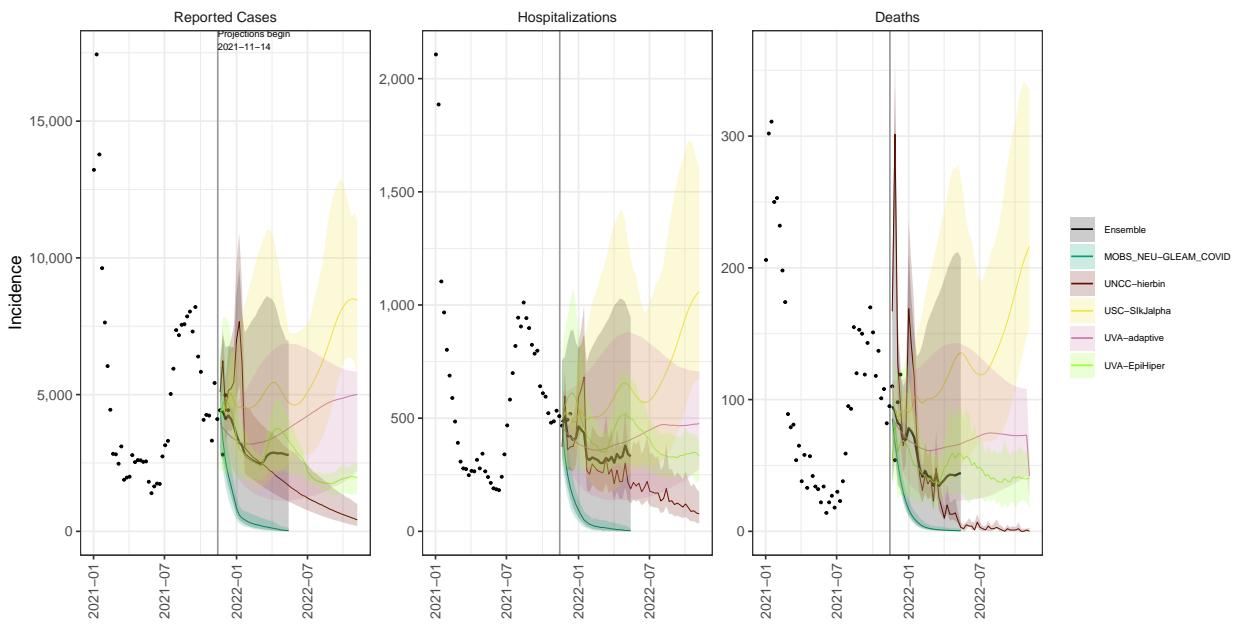
MT model variance & 95% projection intervals – Pessimistic waning, low booster coverage



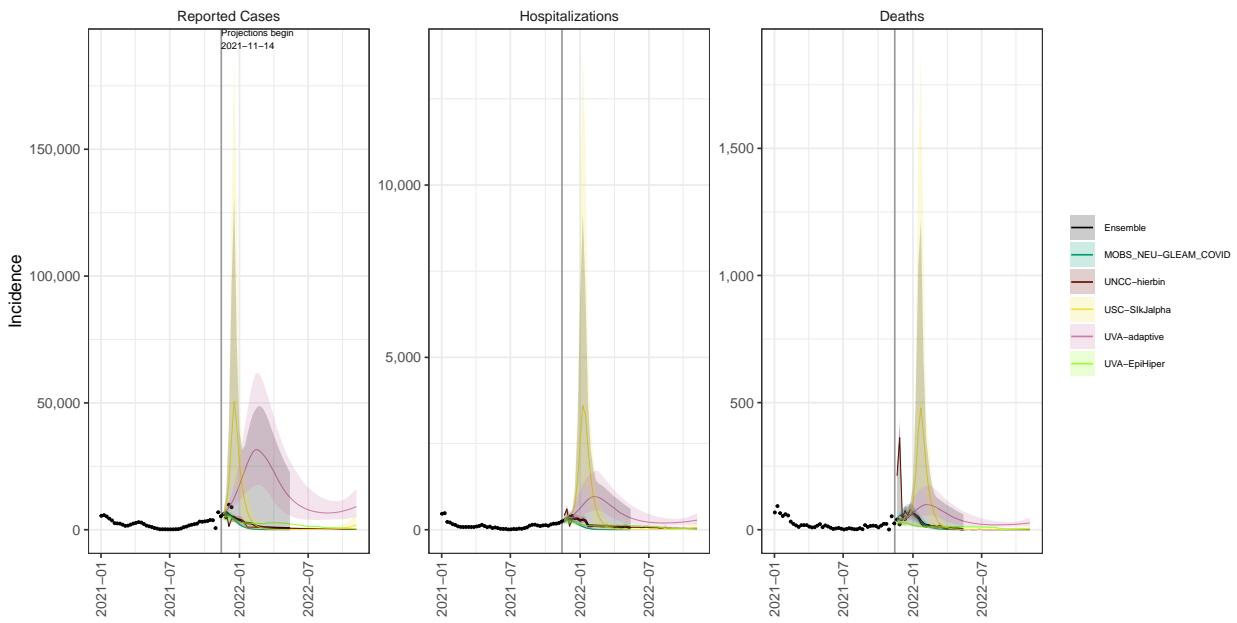
NE model variance & 95% projection intervals – Pessimistic waning, low booster coverage



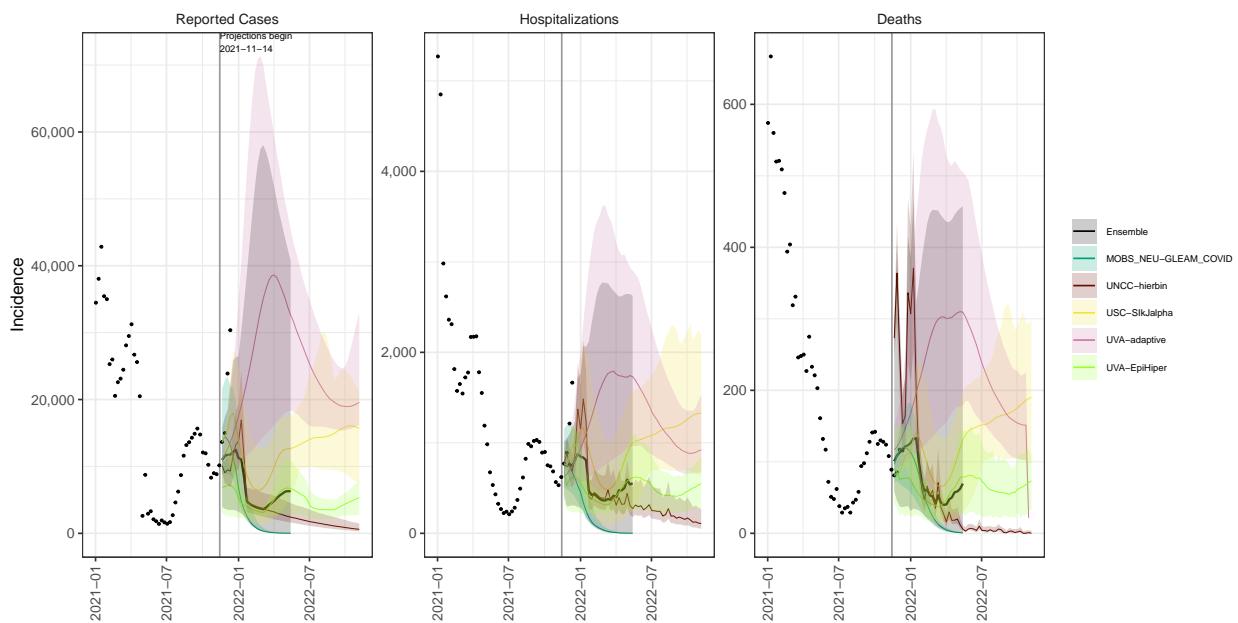
### NV model variance & 95% projection intervals – Pessimistic waning, low booster coverage



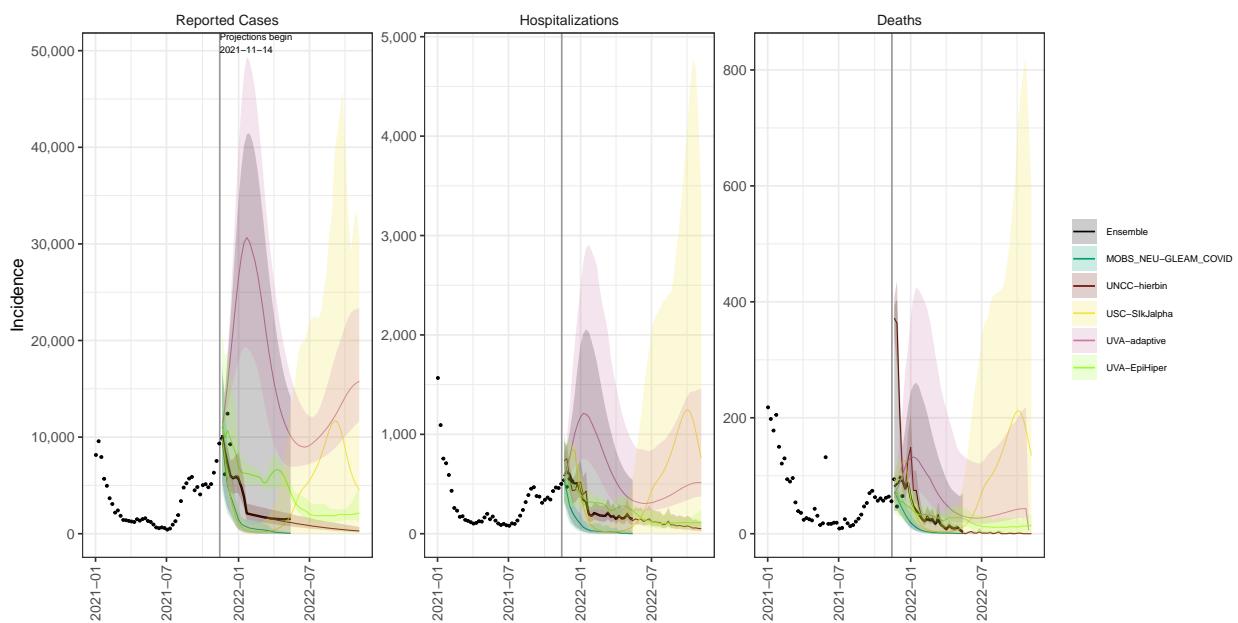
### NH model variance & 95% projection intervals – Pessimistic waning, low booster coverage



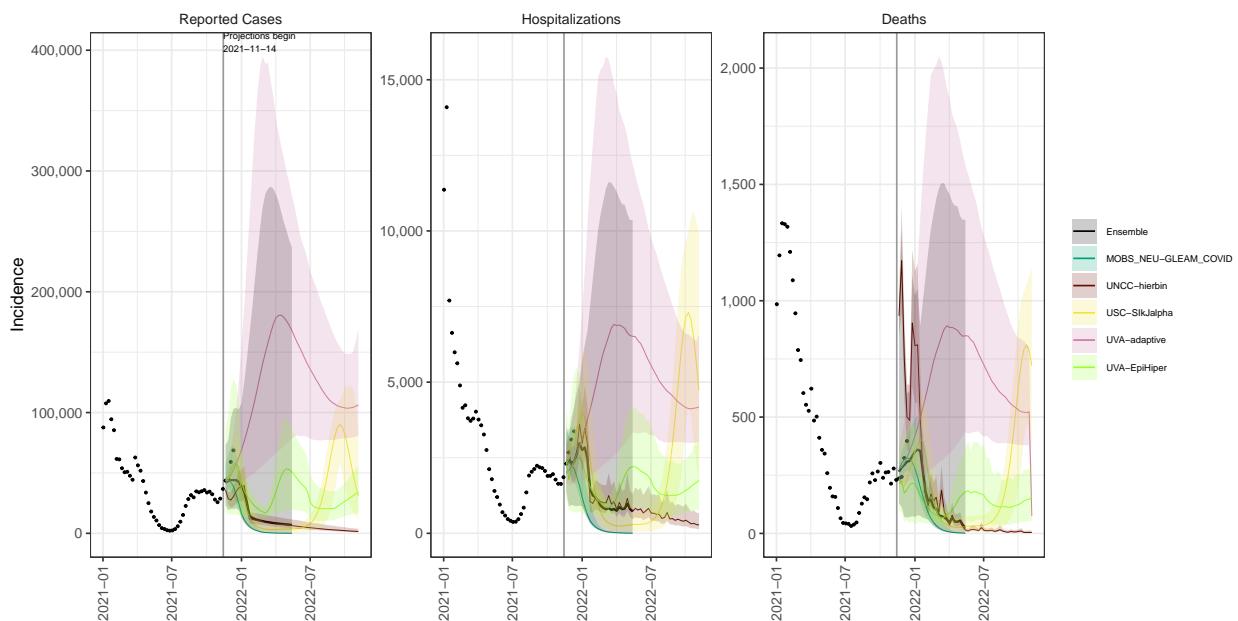
### NJ model variance & 95% projection intervals – Pessimistic waning, low booster coverage



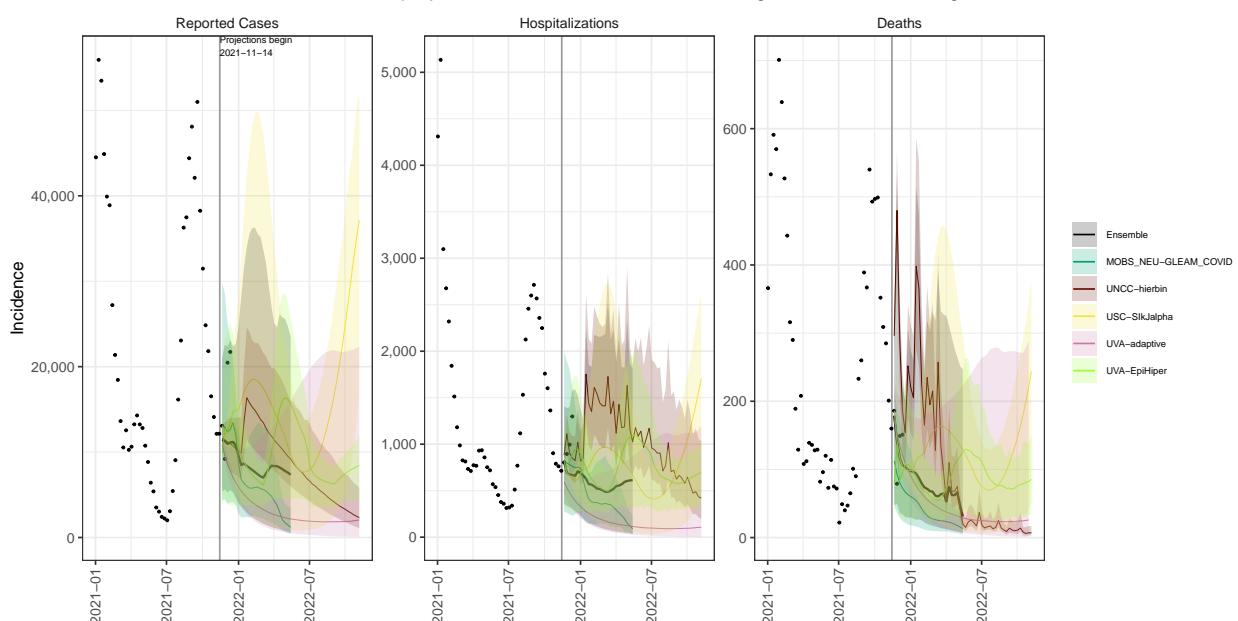
### NM model variance & 95% projection intervals – Pessimistic waning, low booster coverage



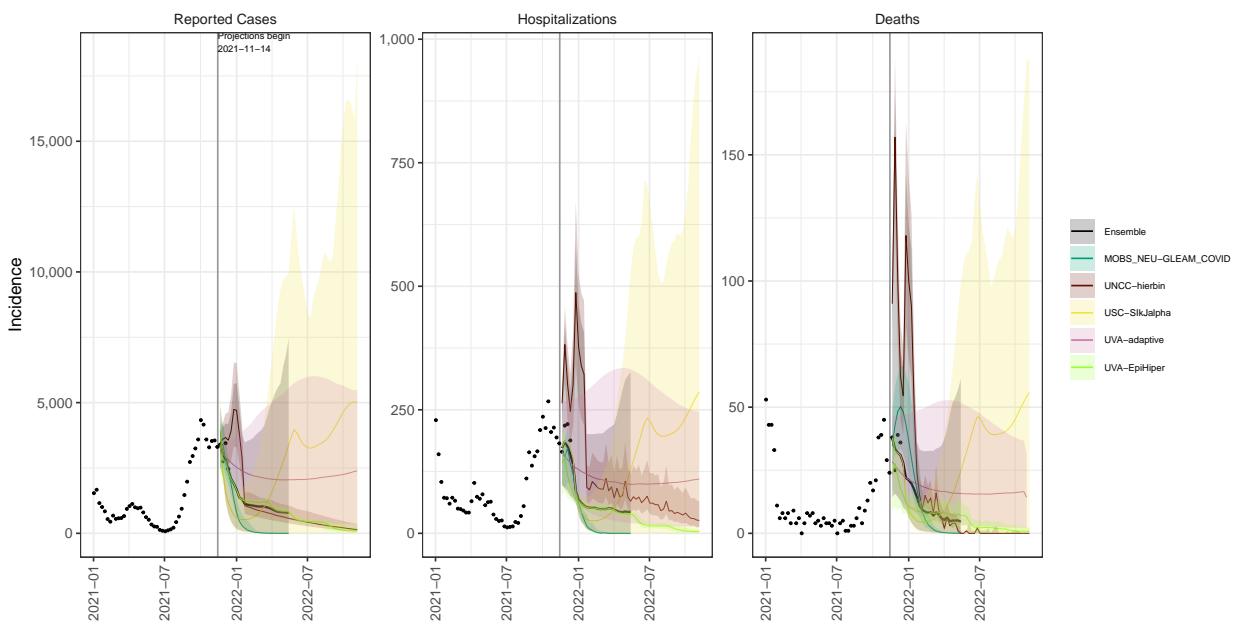
NY model variance & 95% projection intervals – Pessimistic waning, low booster coverage



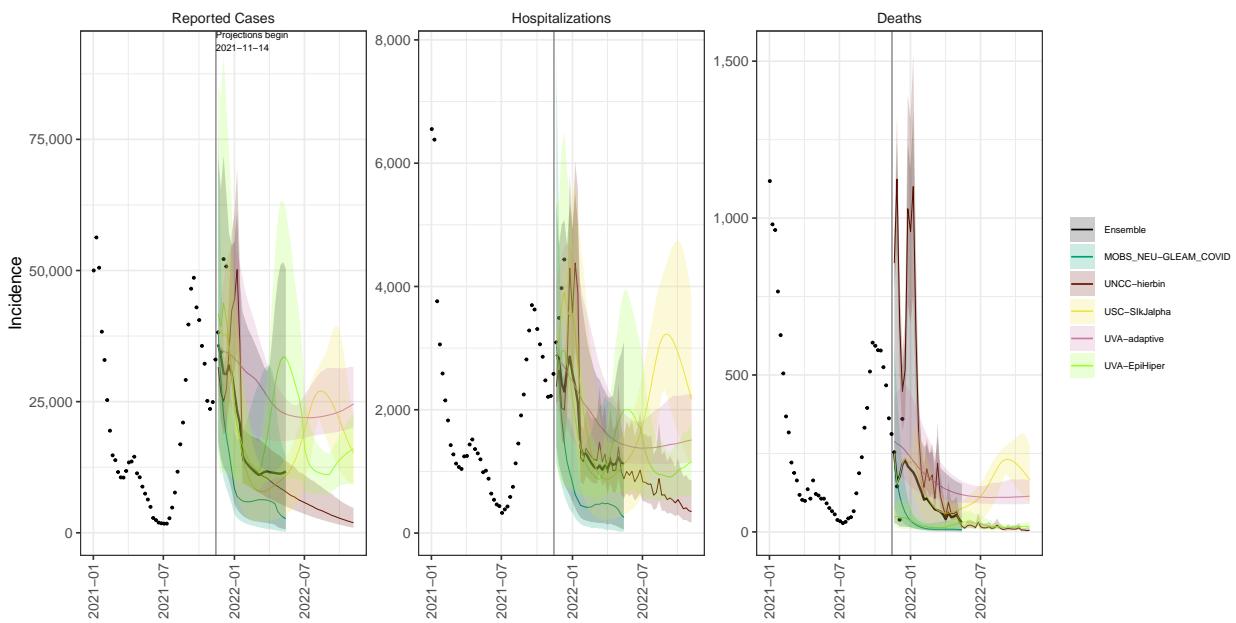
NC model variance & 95% projection intervals – Pessimistic waning, low booster coverage



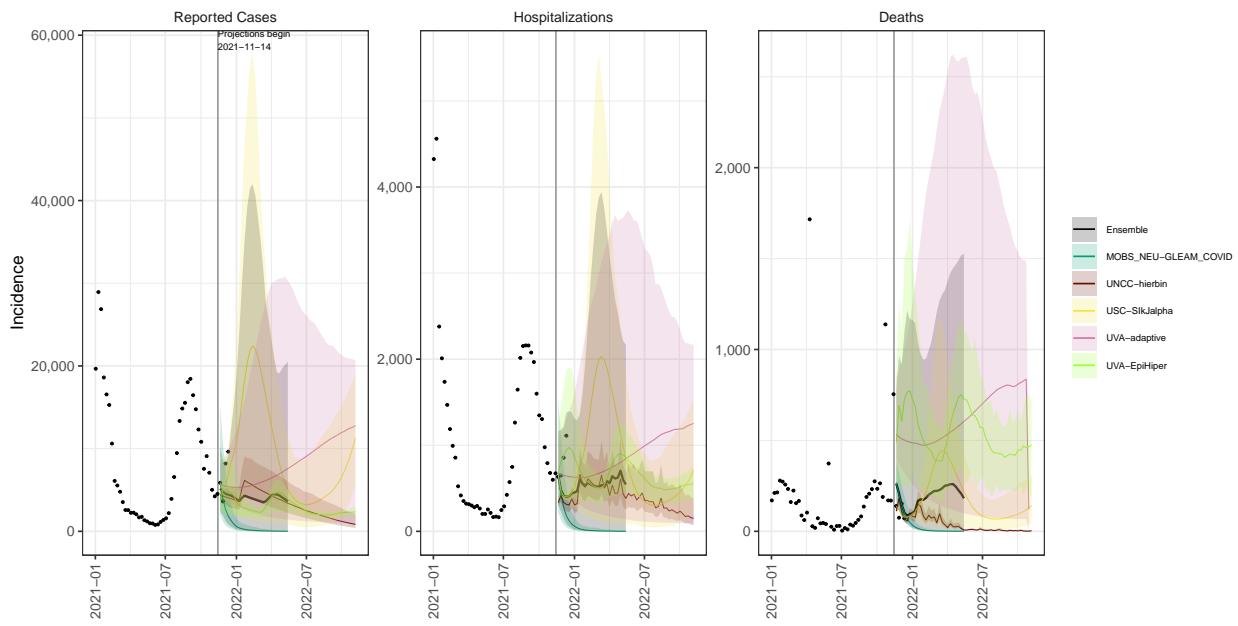
ND model variance & 95% projection intervals – Pessimistic waning, low booster coverage



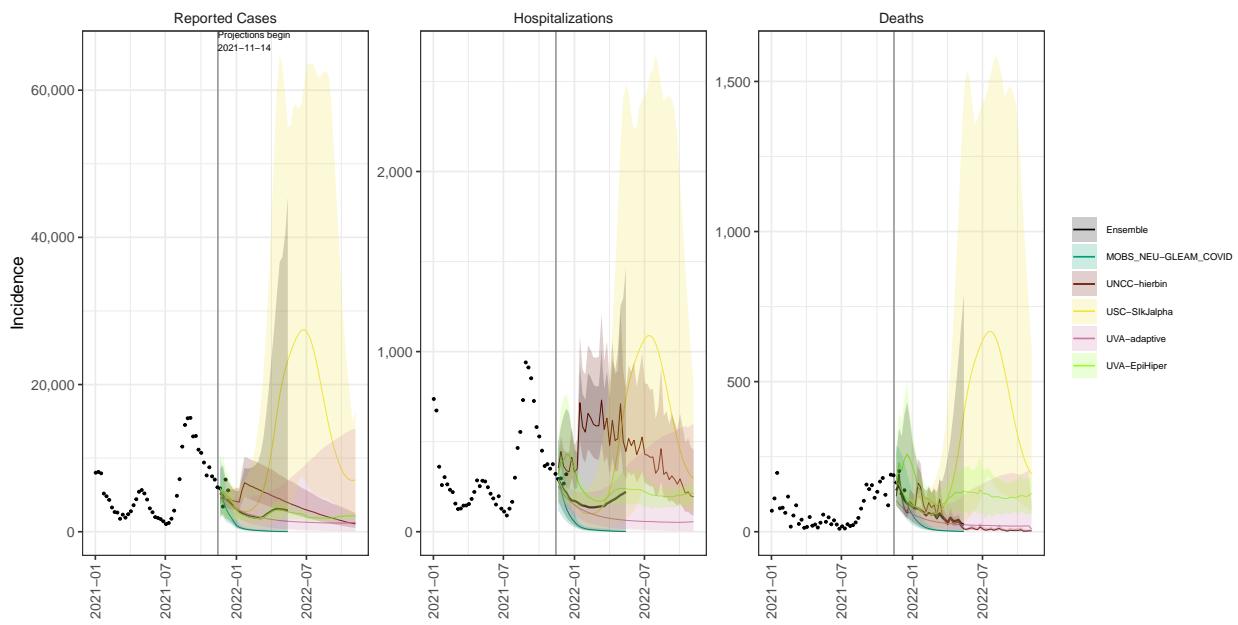
OH model variance & 95% projection intervals – Pessimistic waning, low booster coverage



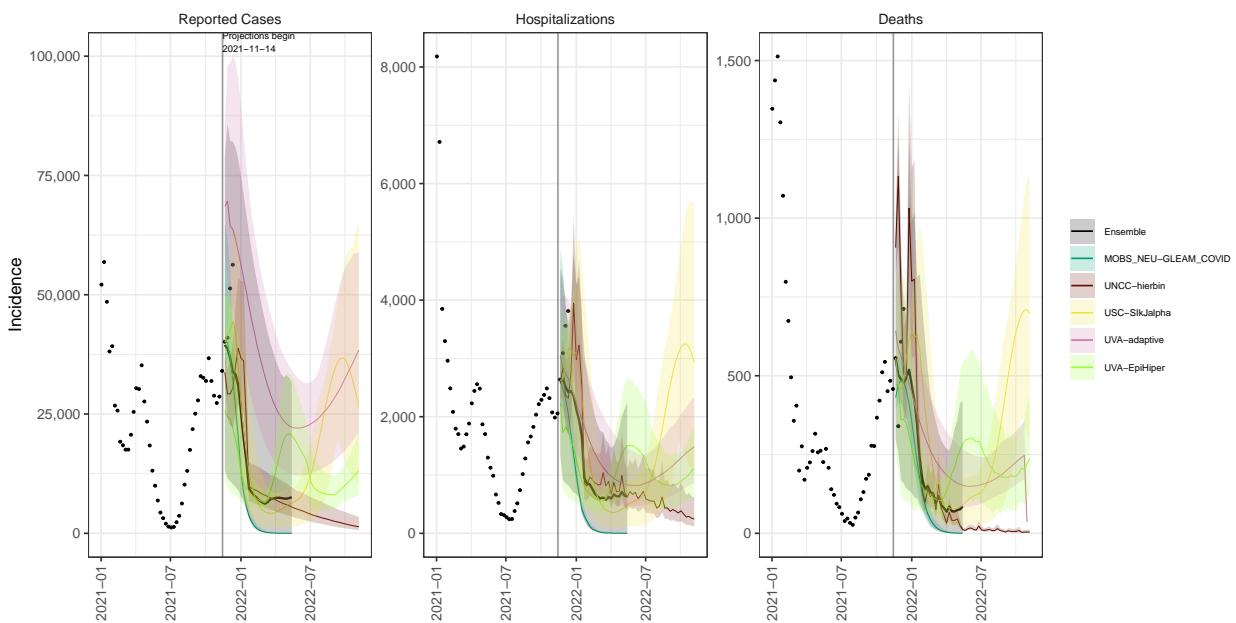
OK model variance & 95% projection intervals – Pessimistic waning, low booster coverage



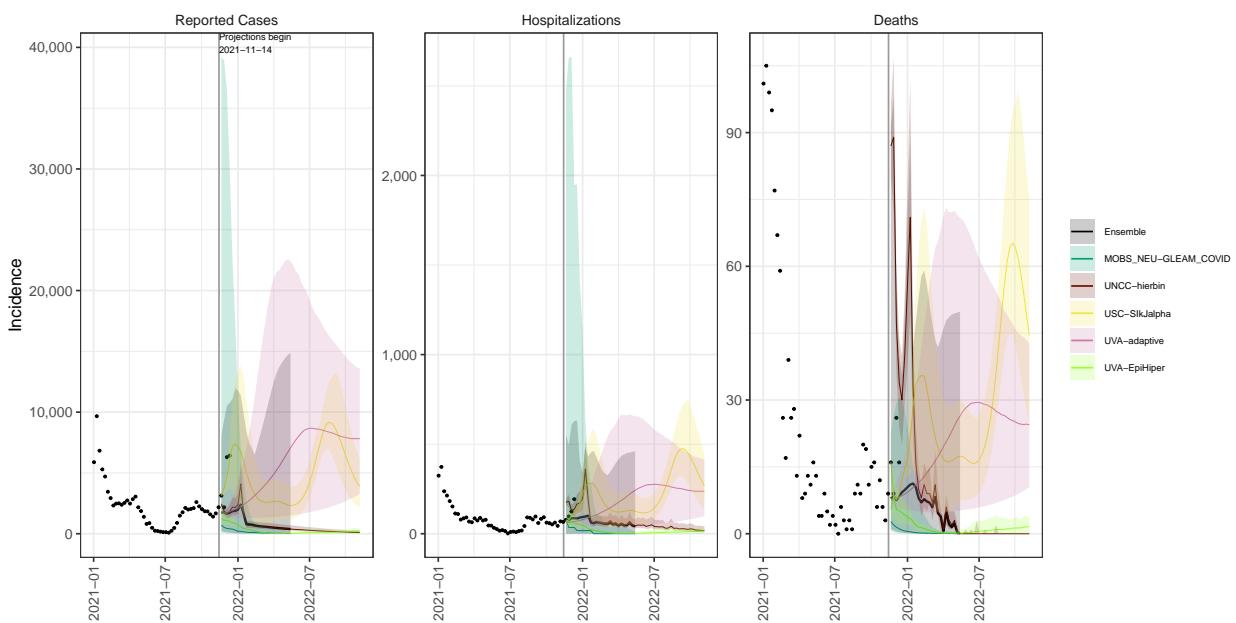
OR model variance & 95% projection intervals – Pessimistic waning, low booster coverage



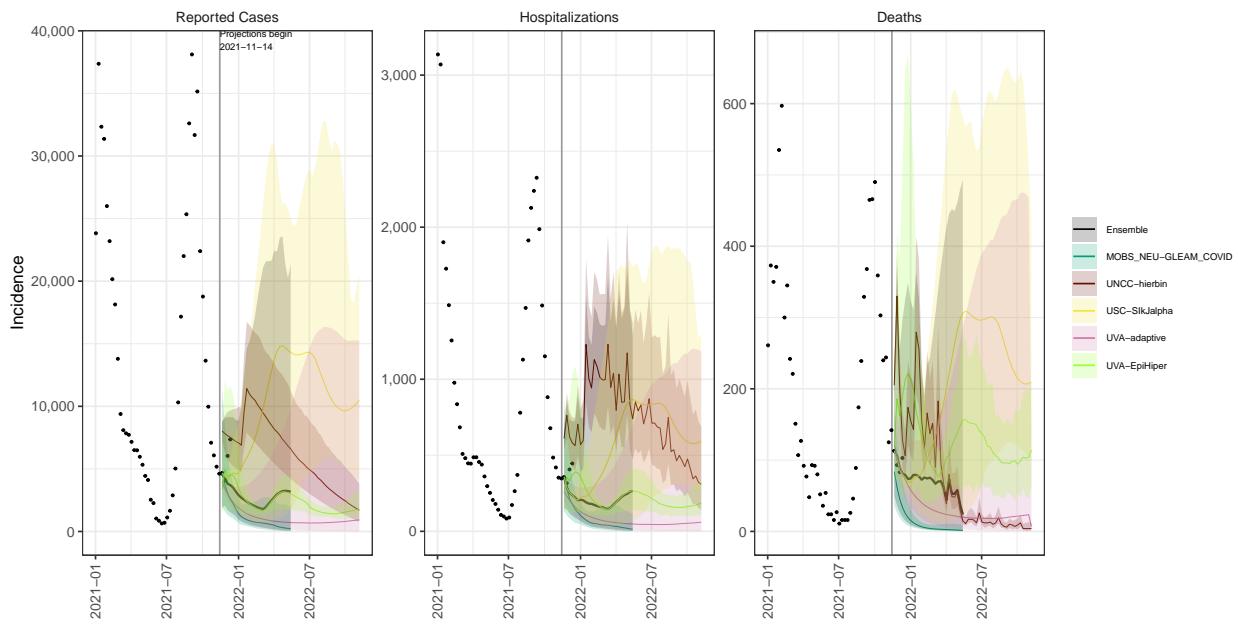
PA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



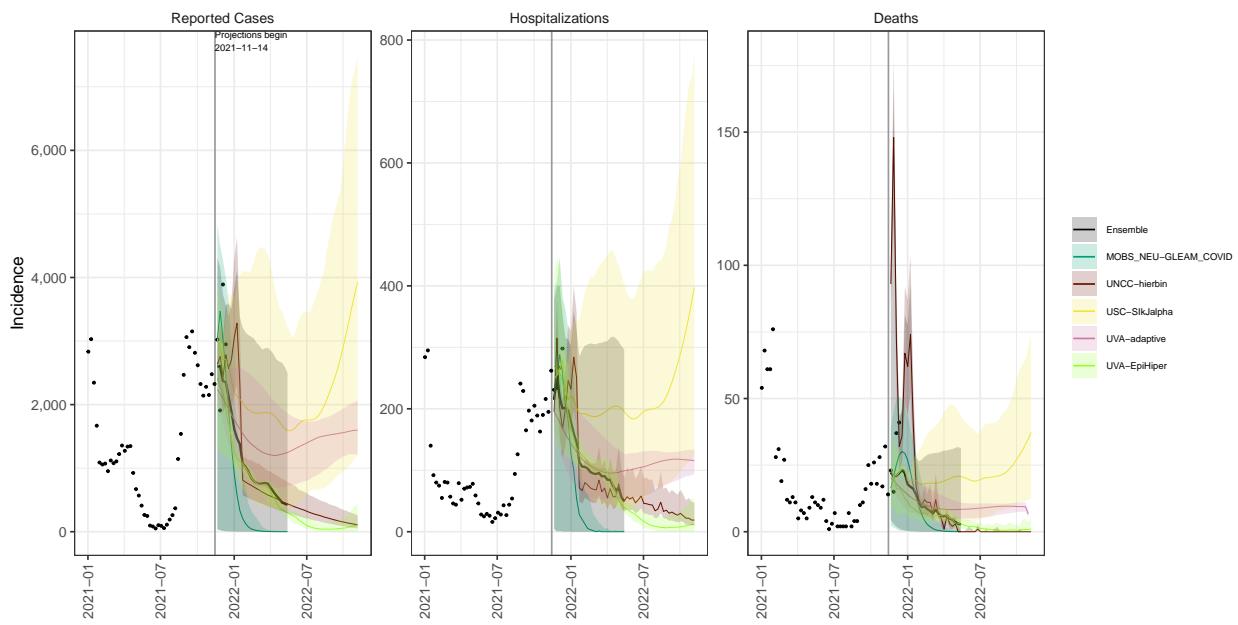
RI model variance & 95% projection intervals – Pessimistic waning, low booster coverage



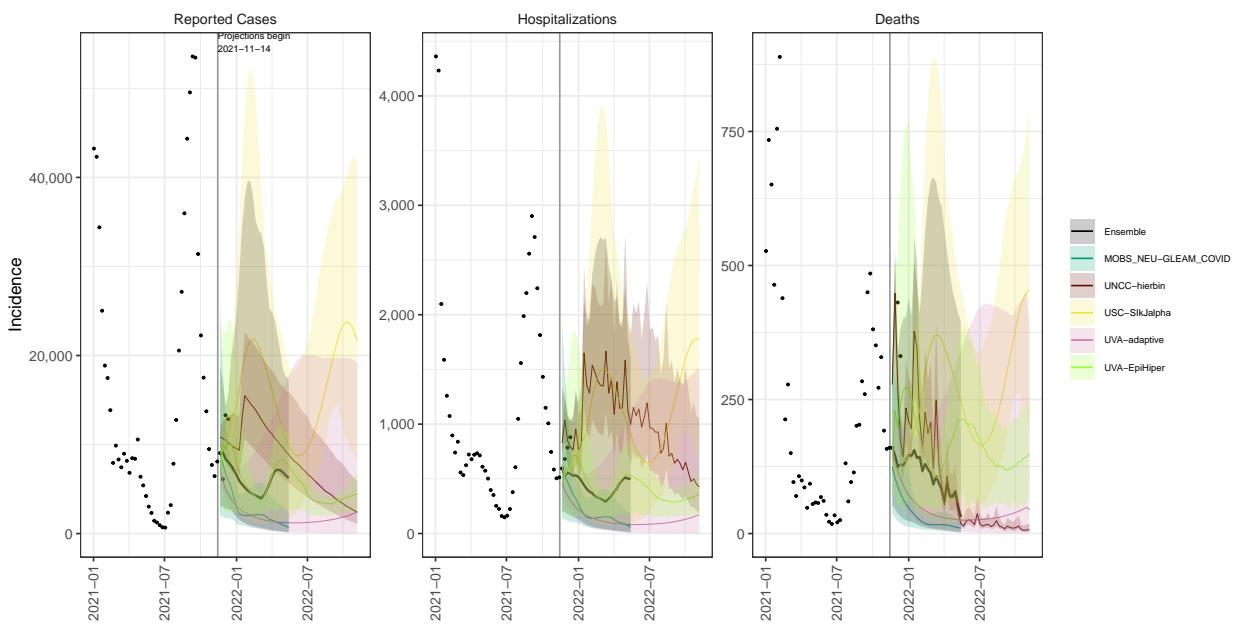
SC model variance & 95% projection intervals – Pessimistic waning, low booster coverage



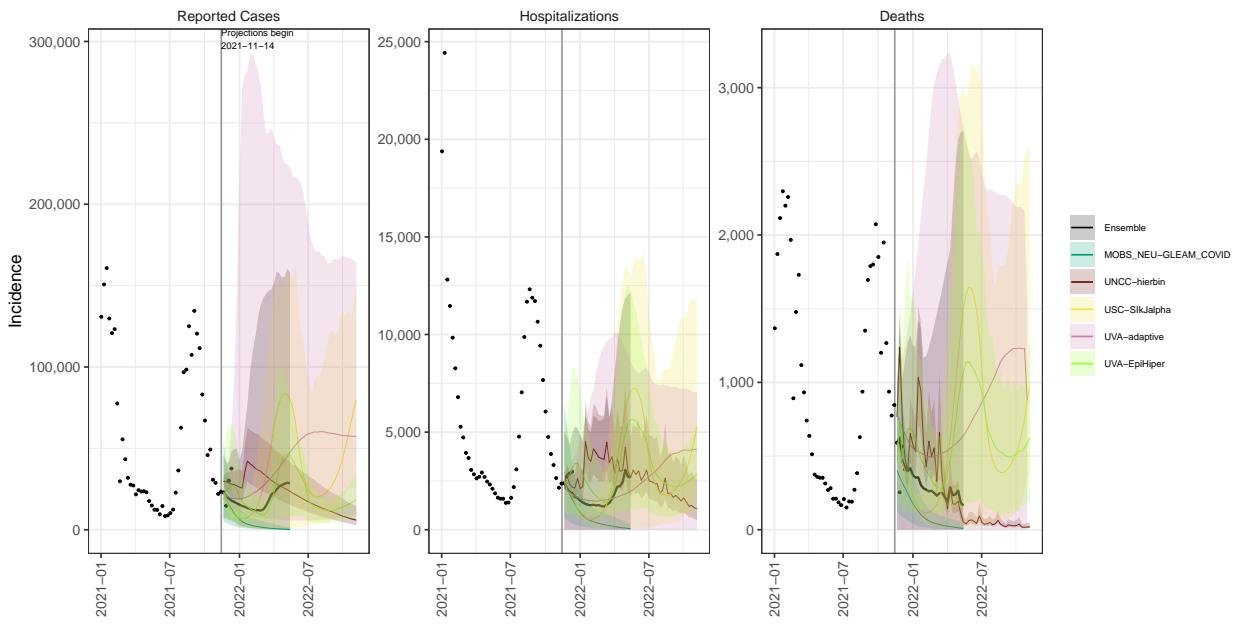
SD model variance & 95% projection intervals – Pessimistic waning, low booster coverage



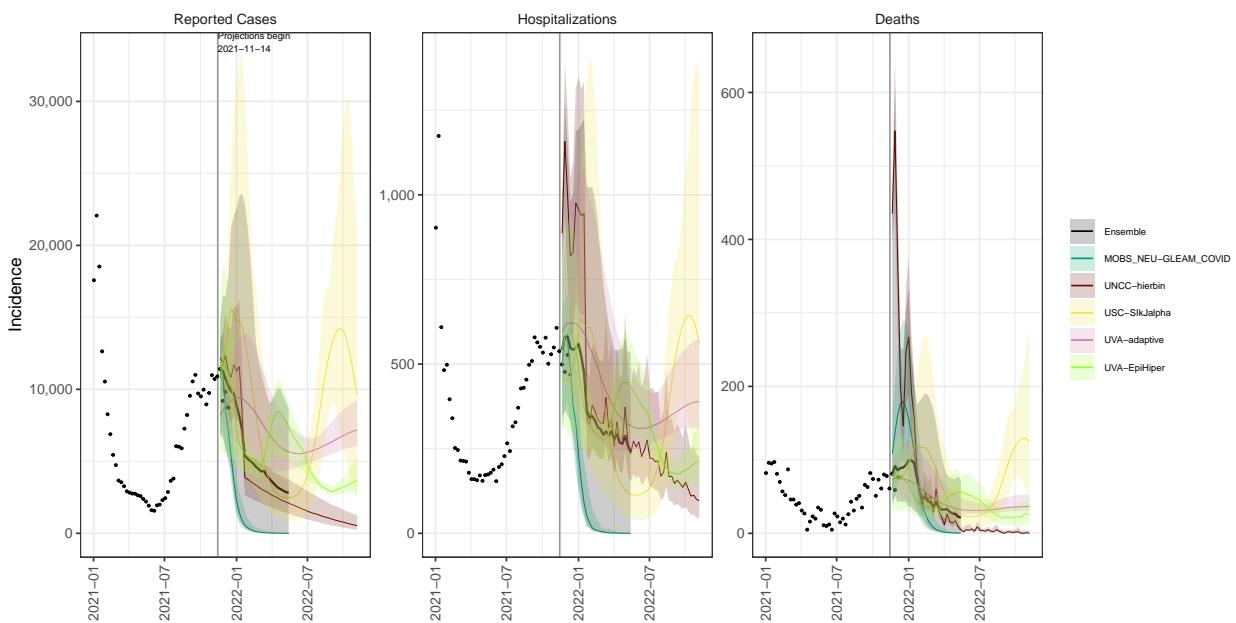
TN model variance & 95% projection intervals – Pessimistic waning, low booster coverage



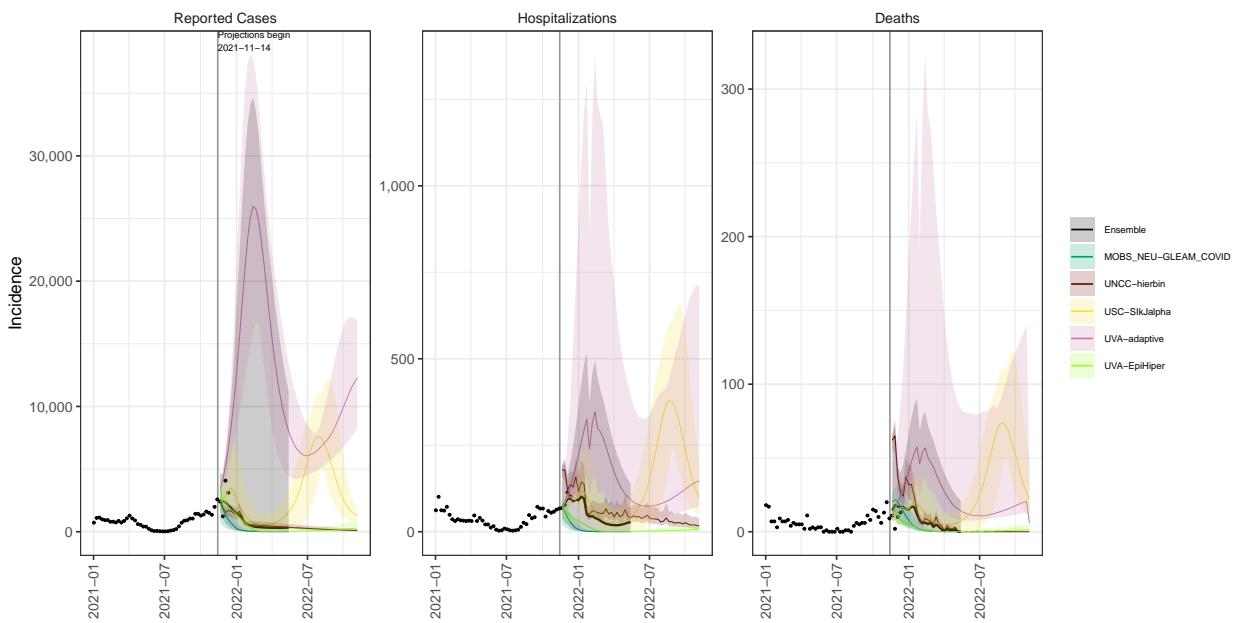
TX model variance & 95% projection intervals – Pessimistic waning, low booster coverage



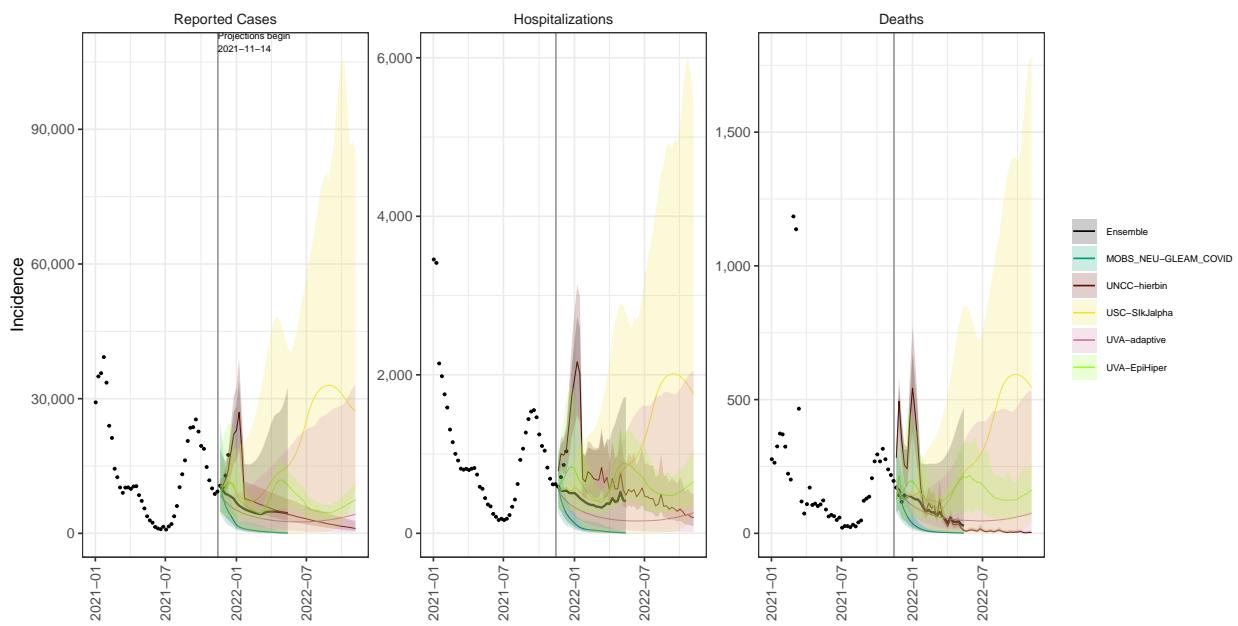
UT model variance & 95% projection intervals – Pessimistic waning, low booster coverage



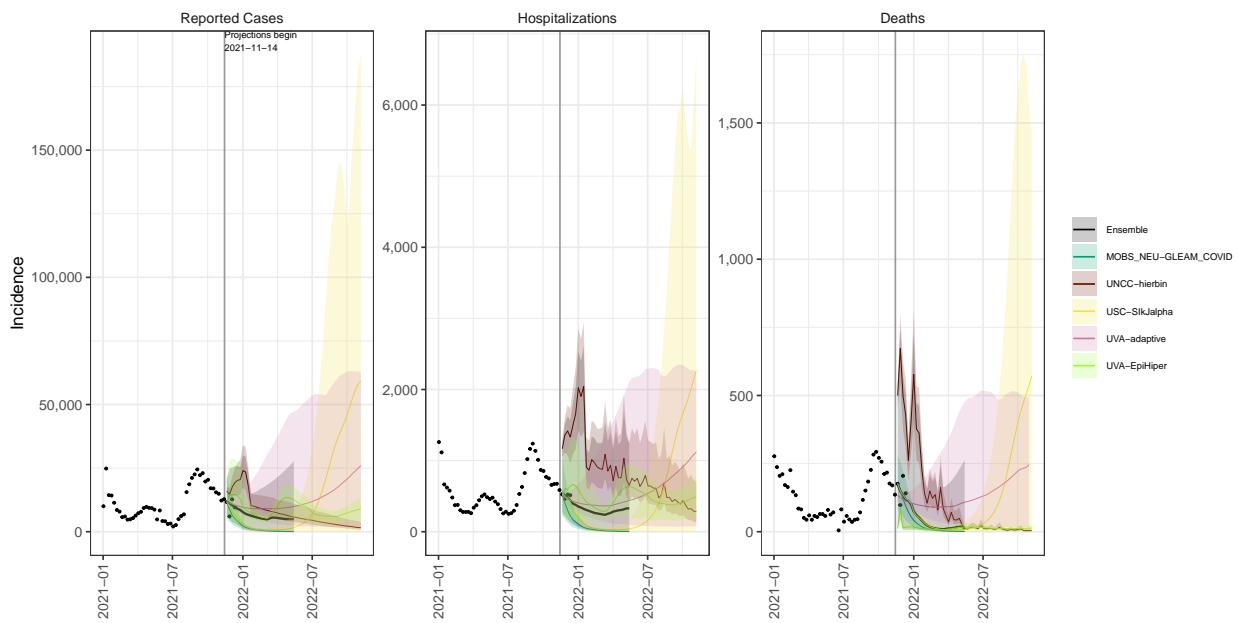
VT model variance & 95% projection intervals – Pessimistic waning, low booster coverage



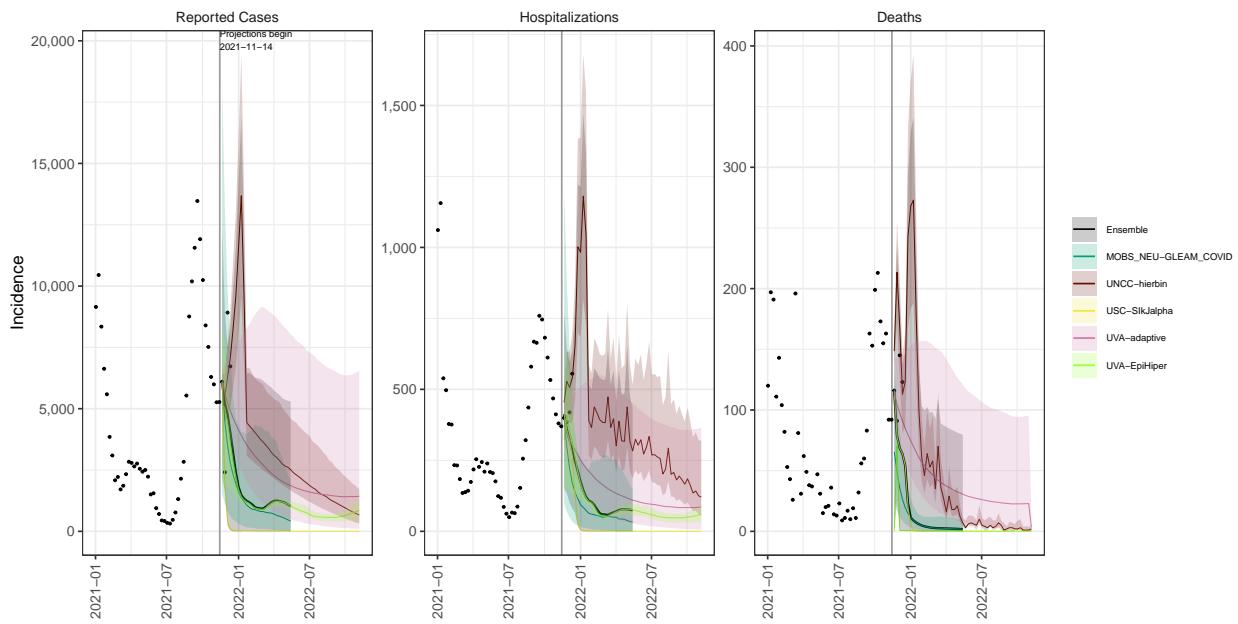
VA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



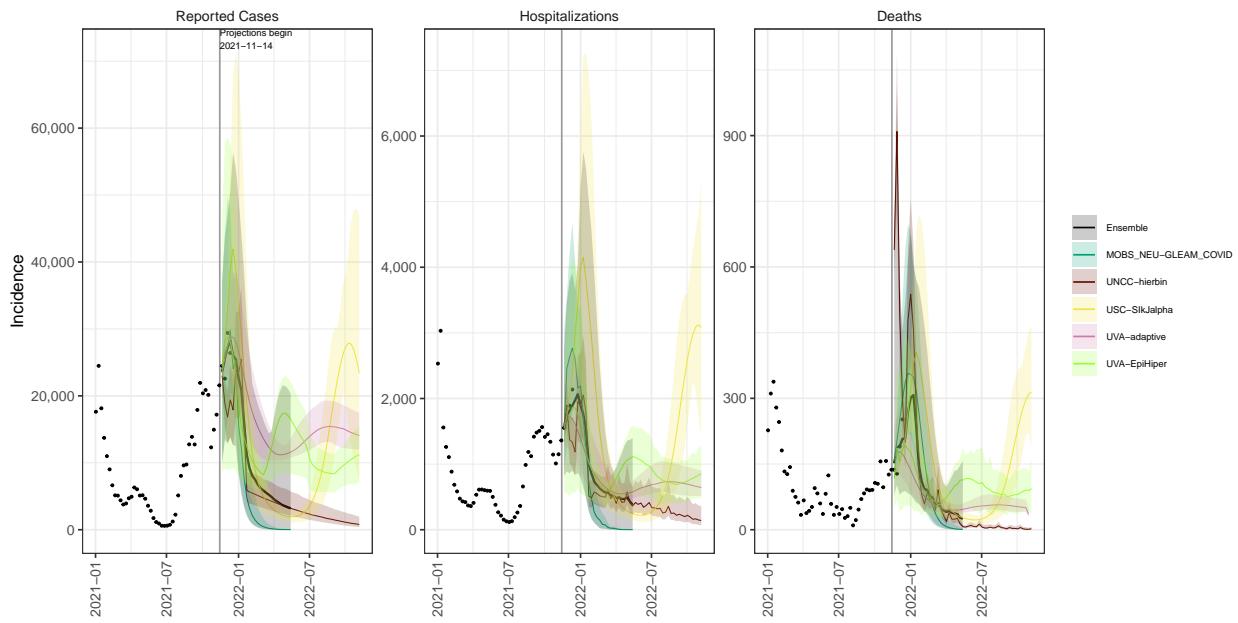
WA model variance & 95% projection intervals – Pessimistic waning, low booster coverage



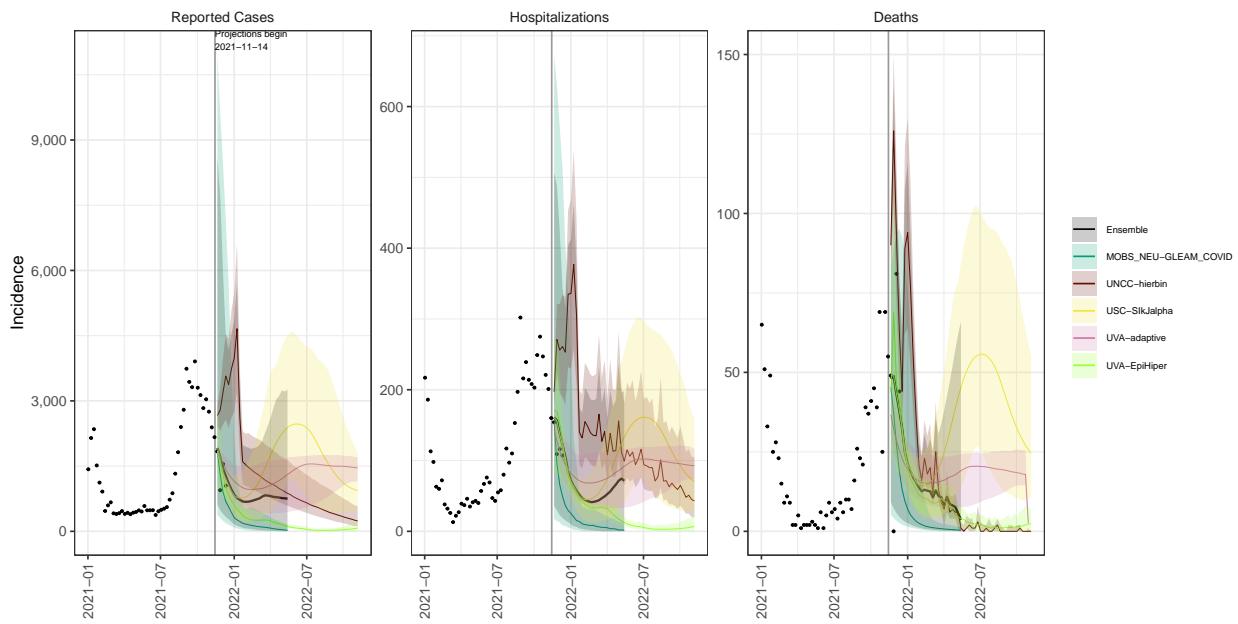
WV model variance & 95% projection intervals – Pessimistic waning, low booster coverage



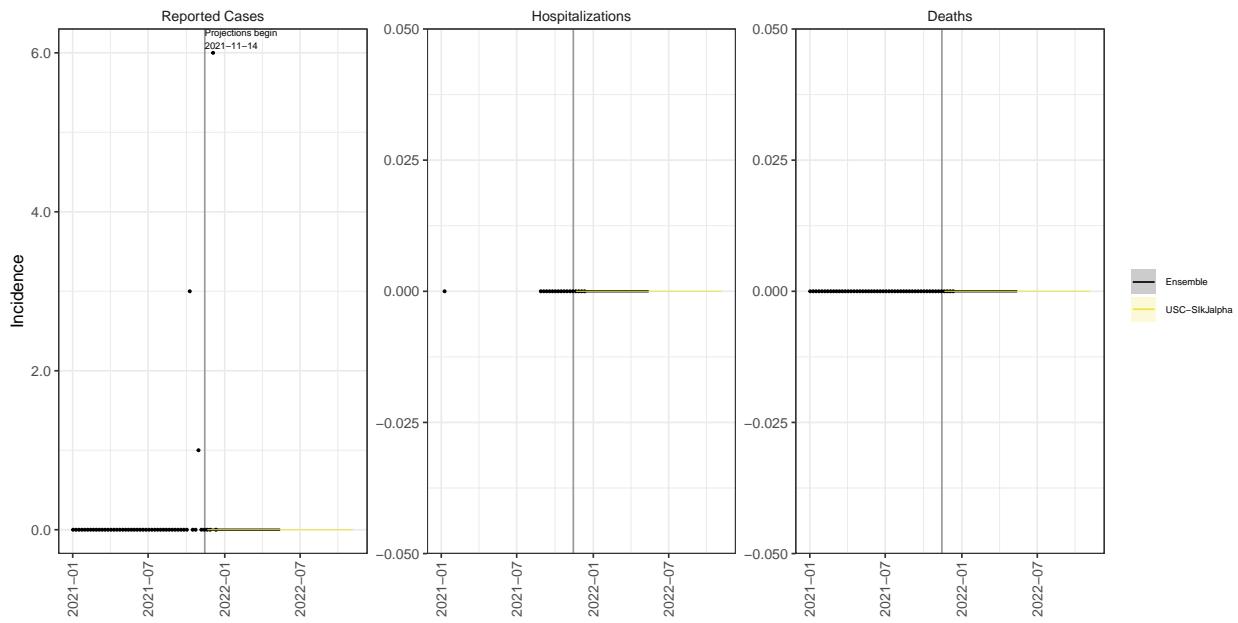
WI model variance & 95% projection intervals – Pessimistic waning, low booster coverage



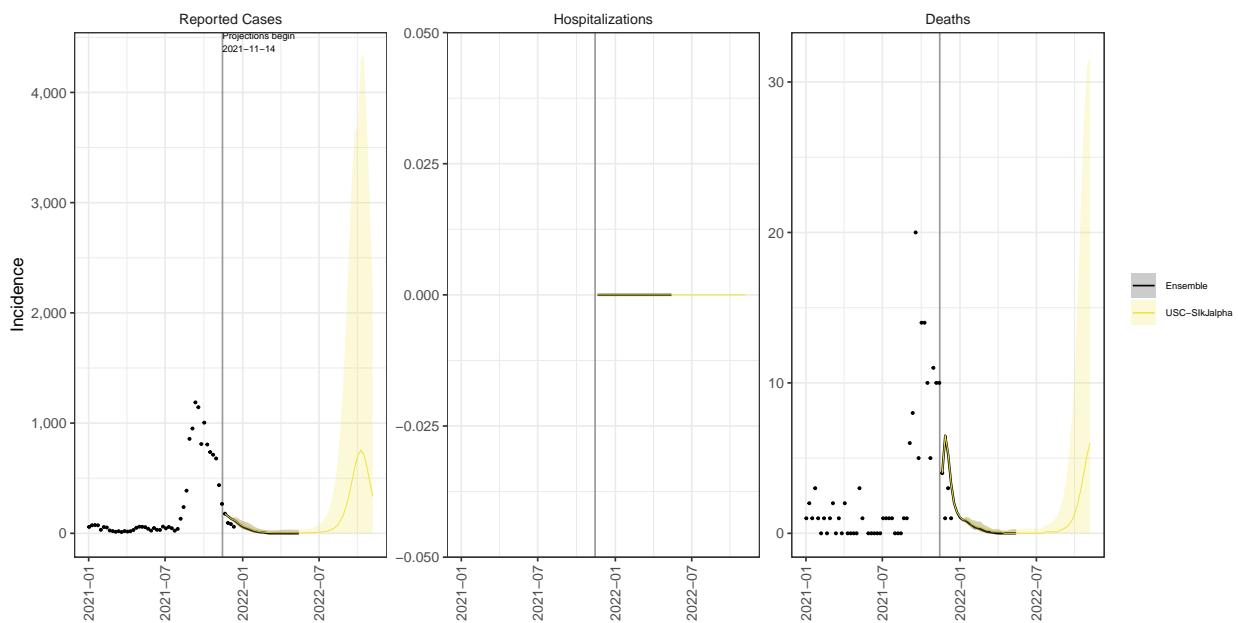
WY model variance & 95% projection intervals – Pessimistic waning, low booster coverage



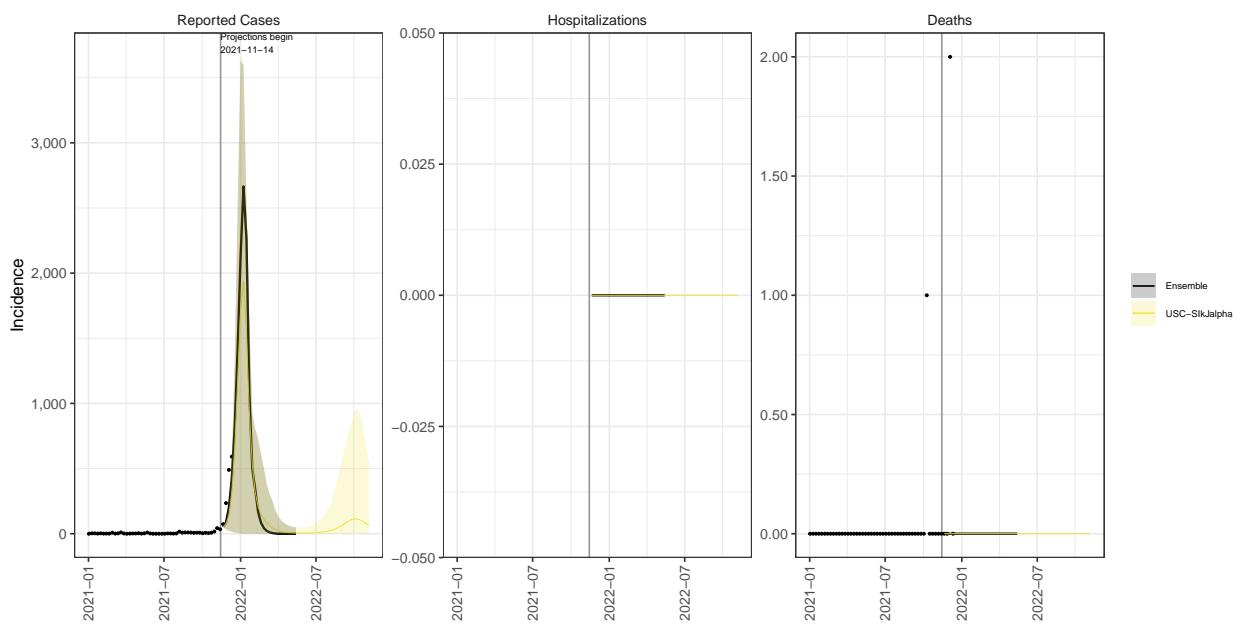
AS model variance & 95% projection intervals – Pessimistic waning, low booster coverage



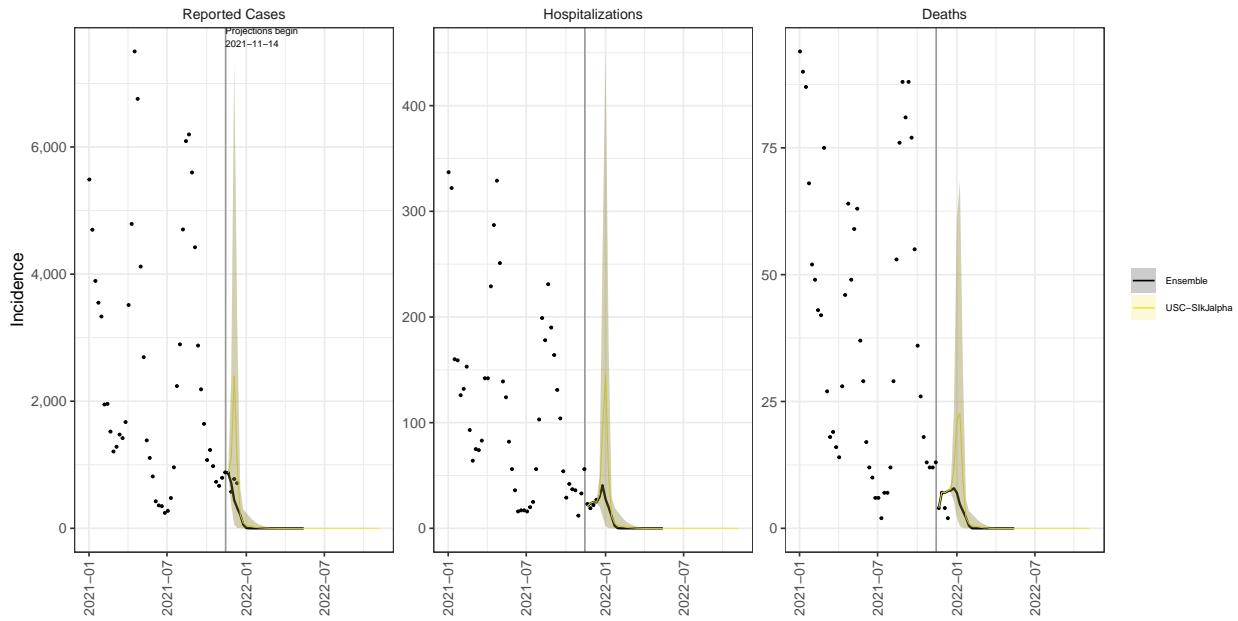
GU model variance & 95% projection intervals – Pessimistic waning, low booster coverage



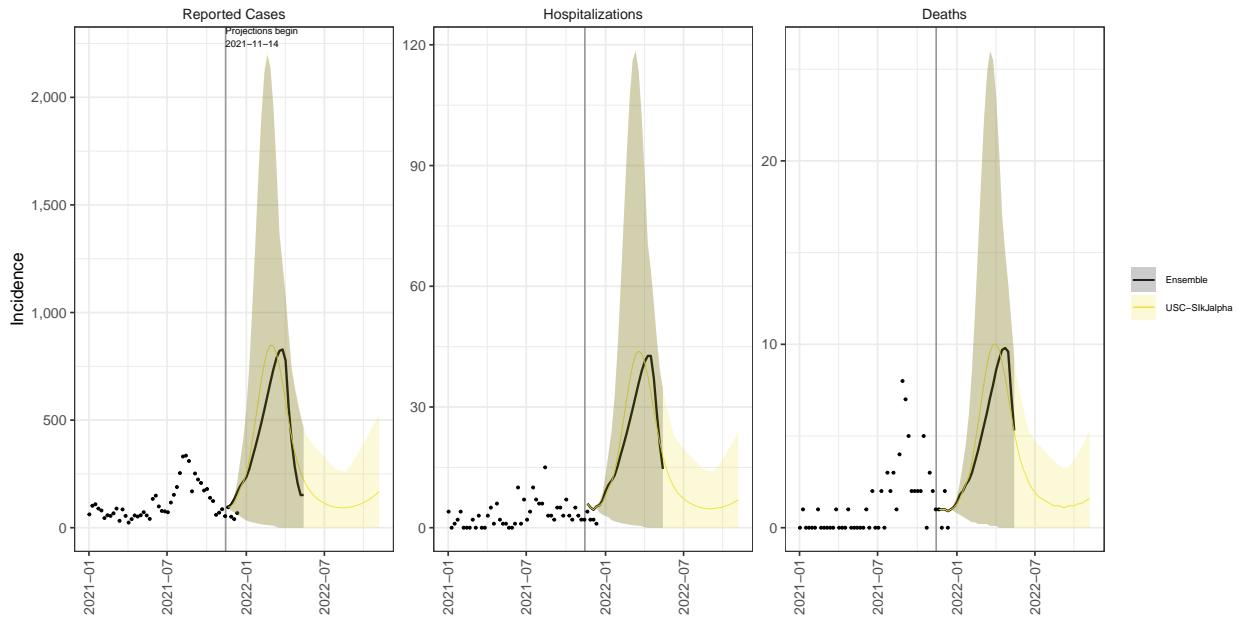
MP model variance & 95% projection intervals – Pessimistic waning, low booster coverage



PR model variance & 95% projection intervals – Pessimistic waning, low booster coverage



VI model variance & 95% projection intervals – Pessimistic waning, low booster coverage



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