

COVID-19 Scenario Modeling Hub Report

11 August, 2022

Scenario Modeling Hub Team¹

Executive Summary

This report presents the results of the fifteenth round of projections from the COVID-19 Scenario Modeling Hub. A consortium of seven modeling groups convened to generate week ahead projections of COVID-19 cases, deaths, and hospitalizations for a period of twelve months (weeks ending 2022-08-06 to 2023-05-06), given four scenarios of timing of a booster campaign and emergence of a new variant. 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 Fifteenth Round

- In Round 15, we assessed the impact of reformulated booster vaccination campaigns starting in mid September or mid November, combined with the presence or absence of a hypothetical immune escape variant with increased severity arriving in the fall. Ensemble projections are based on contributions from 6 teams (5 nationally) and cover the period from Aug 6, 2022 to May 6, 2023.
- In the absence of a new variant, and with a late vaccination campaign, hospitalizations are projected to gradually decline until the end of the year, with the majority of the 50% projection interval being at, or lower than, starting levels of hospitalization.
- There is a small likelihood that hospitalizations will continue to increase, fueled by summer variants and waning immunity, with the upper bound of the 95% projection interval peaking at ~75% of the Omicron level.
- Early distribution of boosters is expected to decrease hospitalizations starting in October, but this is balanced by a greater likelihood of an earlier, and possibly higher, hospitalization resurgence in early 2023, compared to the late booster scenario. Over the entire projection period, absent a new variant, early boosters are projected to prevent 2.4M (95% CI 0.8-4.8) cases, 137,000 (95% CI 21,000-251,000) hospitalizations and 9,700 (95% CI 500-19,000) deaths.
- A hypothetical new variant would cause a rebound in hospitalizations starting in November, with a peak near the end of the year. There is large uncertainty in the impact of a new variant in ensemble projections, evidenced by marked differences between model projections for new variant scenarios (B, D). The upper bound of the 50% projection interval reaches 50% of the size of the Omicron hospitalization peak. An early vaccination campaign has little impact on the size of the projected variant peak.
- In the worst case scenario, with a new variant and late boosters, we project 1.3M cumulative hospitalizations (95% PI 0.4-2.7M) and 181,000 cumulative deaths (95% PI 23,000-346,000) to occur over the 7 month projection period. In the best case scenario, in the absence of a new variant and with early boosters, we project 0.7M hospitalizations (95% PI 0.2-1.70M) and 111,000 cumulative deaths (95% PI 11,000-212,000).
- Overall, we estimate that early boosters would avert 6-12% of cases, 10-16% of hospitalizations and 12-15% of deaths, depending on the variant scenario.
- There is still heterogeneity between states at this stage of the pandemic. For instance, there is a more pronounced risk of increased hospitalizations projected throughout the rest of the summer in the Midwest. In contrast, an increased risk of a large rebound in hospitalizations is projected to occur later in the rest of the country, primarily driven by the arrival of a new variant.
- A few caveats are worth noting:

¹Compiled by Justin Lessler, Rebecca Borcherding, Emily Howerton, and Claire Smith.

- The vaccine coverage assumed in these projections is indexed on the adult flu vaccine coverage reported for the fall 2020-21 season and is deemed optimistic. This assumes both a fast ramp up of vaccination in the month after boosters become available, and a high saturation coverage, above the levels observed for the first COVID-19 booster uptake in late 2021.
- We assumed that the VE of reformulated boosters was 80% against symptomatic disease immediately after vaccination, and against all strains circulating at the start of the projection period. The efficacy of reformulated boosters against existing and new variants remains unclear, and so does the pace of waning after multiple booster shots and repeat infections.
- Several models indicate that early administration of boosters in the fall could result in a moderate increase in cases and hospitalizations by early 2023, as vaccine protection wanes. We did not consider additional booster campaigns during the projection period, which may shift the estimated benefits. Overall, maintaining a high level of protection throughout an entire respiratory virus season is difficult if vaccines are administered early and only once, in light of waning assumptions (within 3 to 6 months of vaccination, protection against infection is assumed to decrease to 40-60% of the levels observed immediately after vaccination).
- The new variant introduced in these scenarios is purely hypothetical, and any new variant that does emerge may have very different characteristics
- Issues with case ascertainment and delays in death reporting make model calibration difficult for these outcomes. Hospitalizations continue to be a reliable outcome.
- We cannot fully project the impact of changes in behavior and testing practices as we exit the emergency phase of the pandemic.

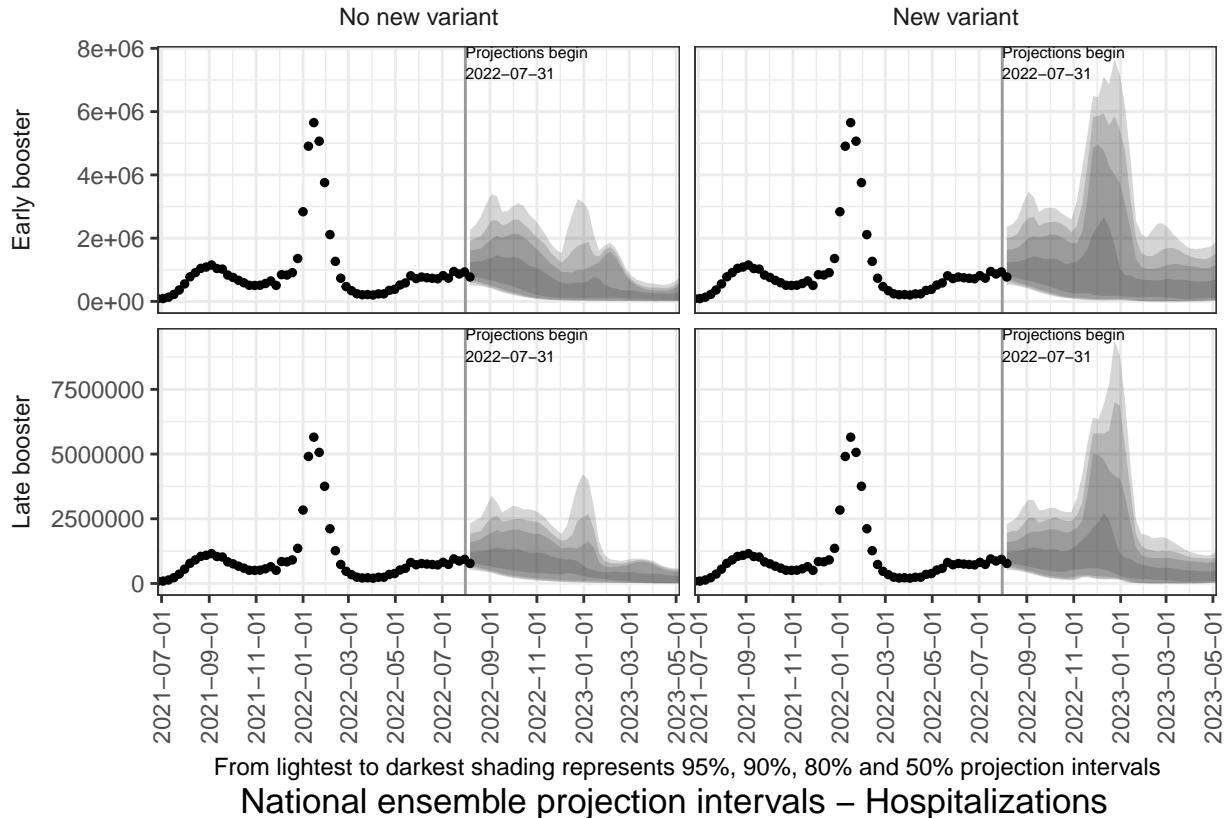
Round 15 Scenario Specifications

See detailed notes on each scenario below	<p>No new variant:</p> <ul style="list-style-type: none"> • No new variant • Protection from natural immunity and VE against infection decrease over time due to waning, but not due to variant mix • Risk of severe disease conditional on infection remains unchanged 	<p>High immune escape variant X:</p> <ul style="list-style-type: none"> • 50 infections with new variant X seeded weekly from Sep 4th-Dec 24th (16 weeks) • 40% immune escape against infection (applies to VE and to protection from natural immunity) • There is a 20% increased risk of hospitalization and death with variant X, relative to Omicron, conditional on infection and immune status.
<p>Reformulated vaccines available Sep-11, 2022 for all adults</p> <ul style="list-style-type: none"> • Coverage of boosters progresses throughout fall 2022 in different age groups at a 10% reduced coverage ($\times 0.9$) compared to historical seasonal flu vaccination; whether individuals get a 2nd or 3rd booster is at teams discretion. • Boosters are recommended regardless of time since previous receipt of a booster. 	Scenario A	Scenario B
<p>Reformulated vaccines available Nov-13, 2022 for all adults</p> <ul style="list-style-type: none"> • Coverage of boosters progresses throughout fall 2022 in different age groups at a 10% reduced coverage ($\times 0.9$) compared to historical seasonal flu vaccination; whether individuals get a 2nd or 3rd booster is at teams discretion. • Boosters are recommended regardless of time since previous receipt of a booster. 	Scenario C	Scenario D

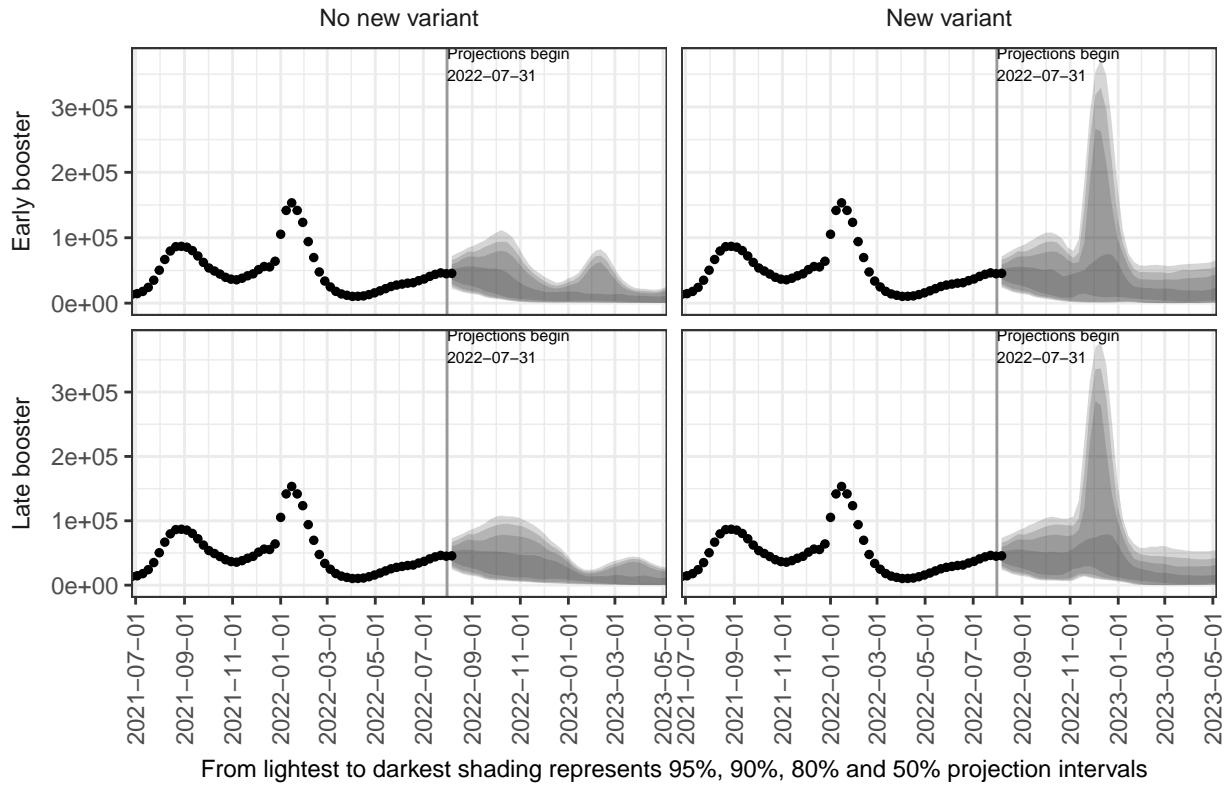
Figure 1: Round 15 Scenario Specifications

Ensemble projection intervals

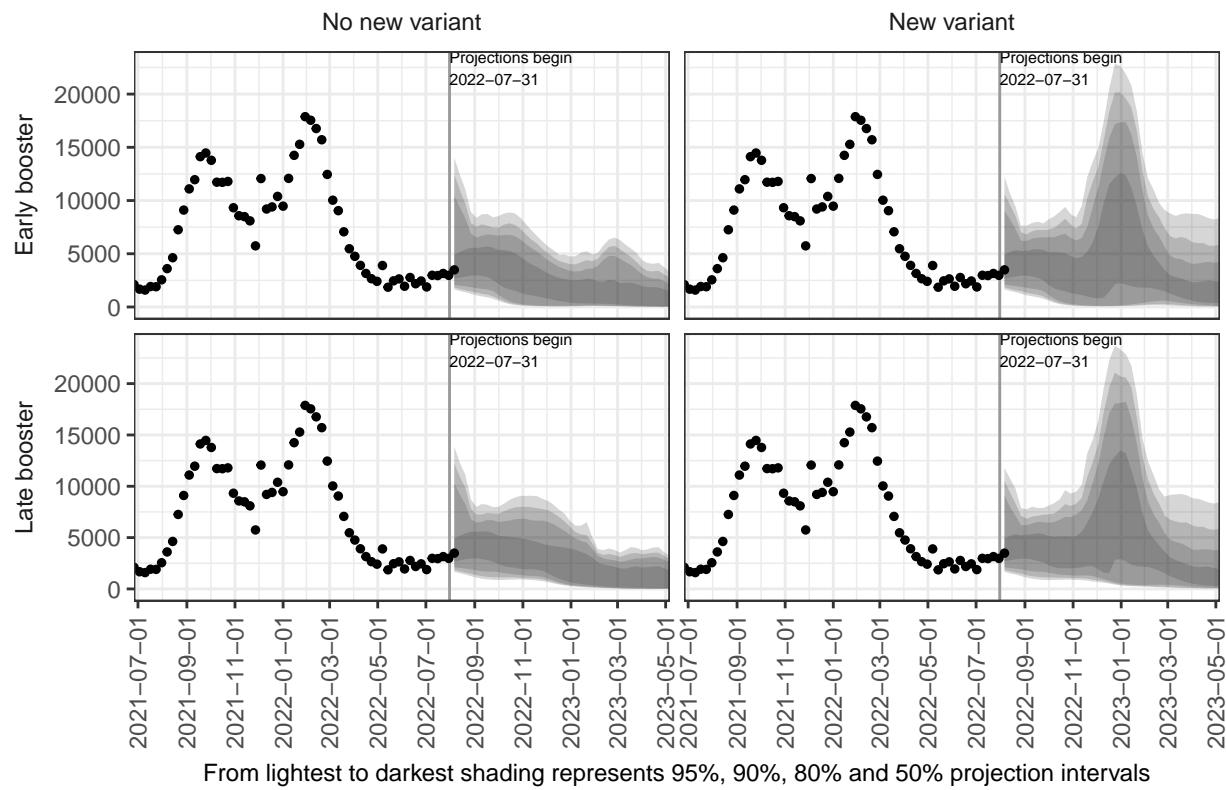
National ensemble projection intervals – Reported Cases



National ensemble projection intervals – Hospitalizations

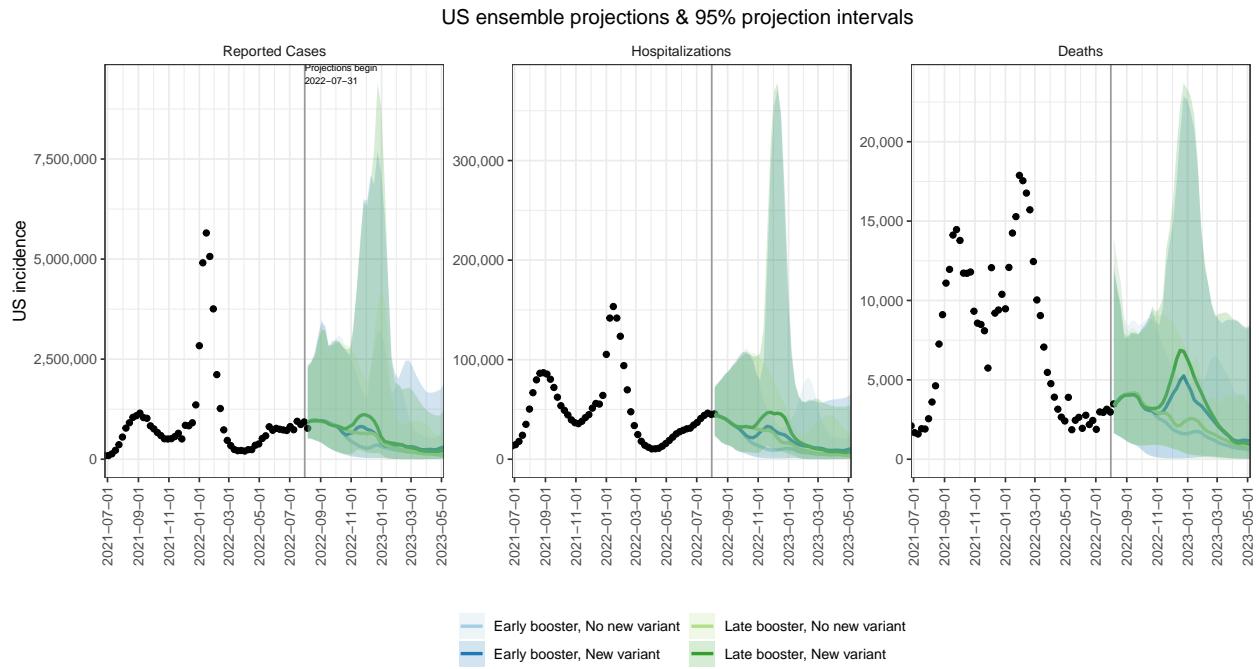


National ensemble projection intervals – Deaths



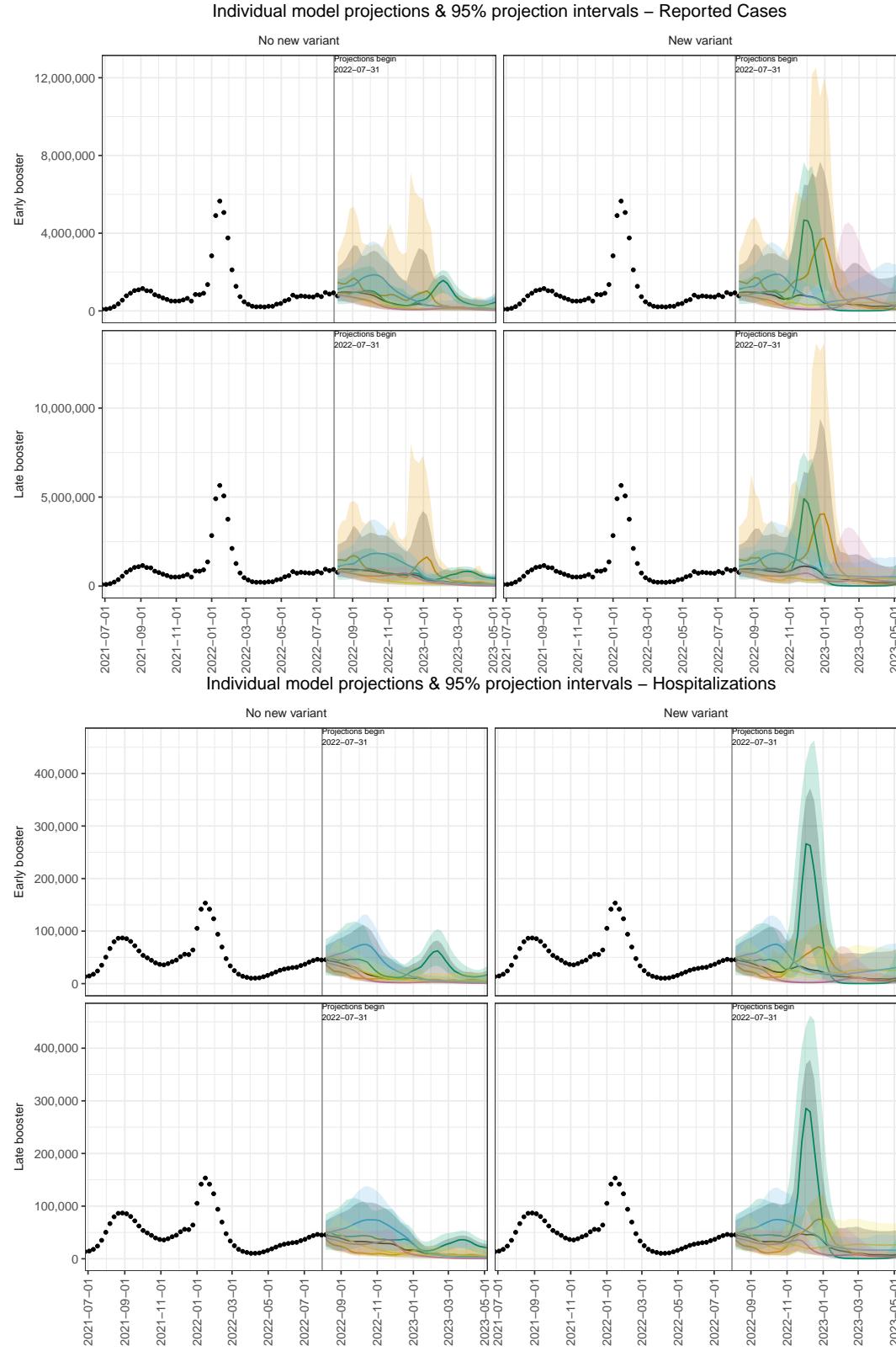
National ensemble projections

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

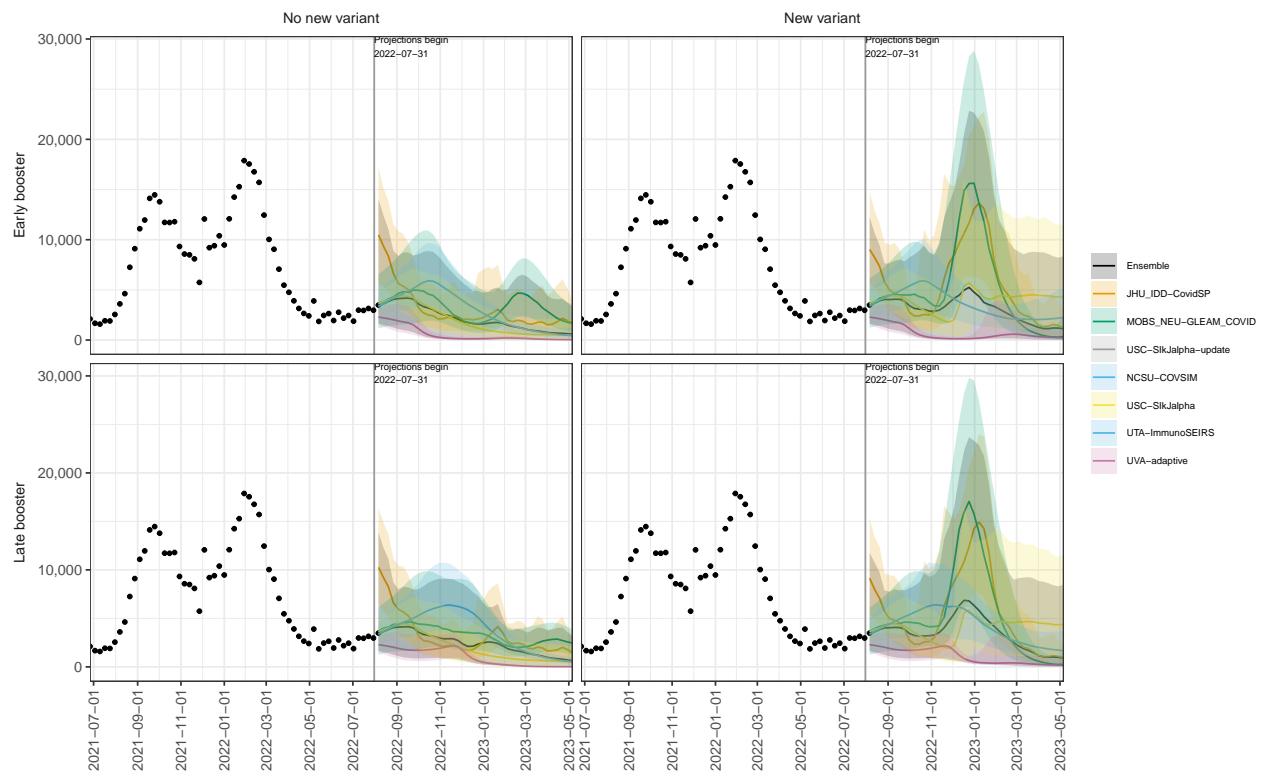


National individual model projections

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



Individual model projections & 95% projection intervals – Deaths



Differences between scenarios

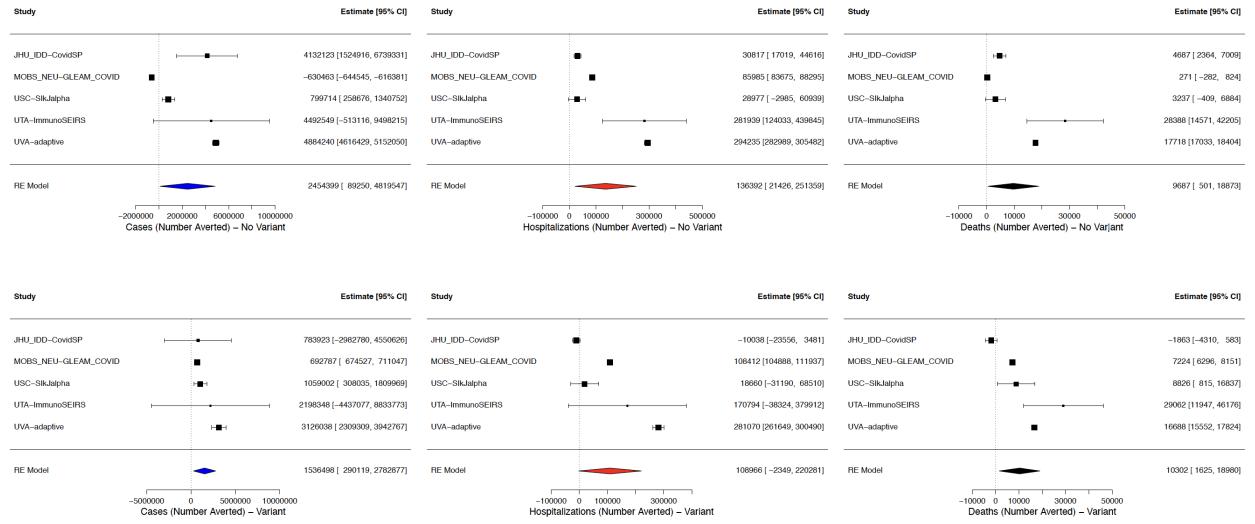
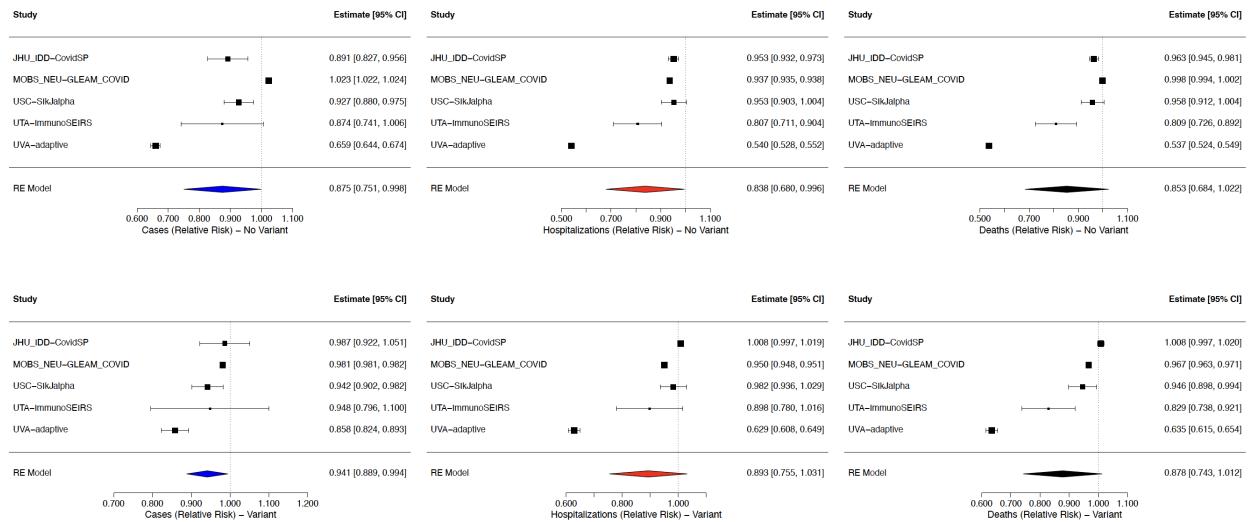
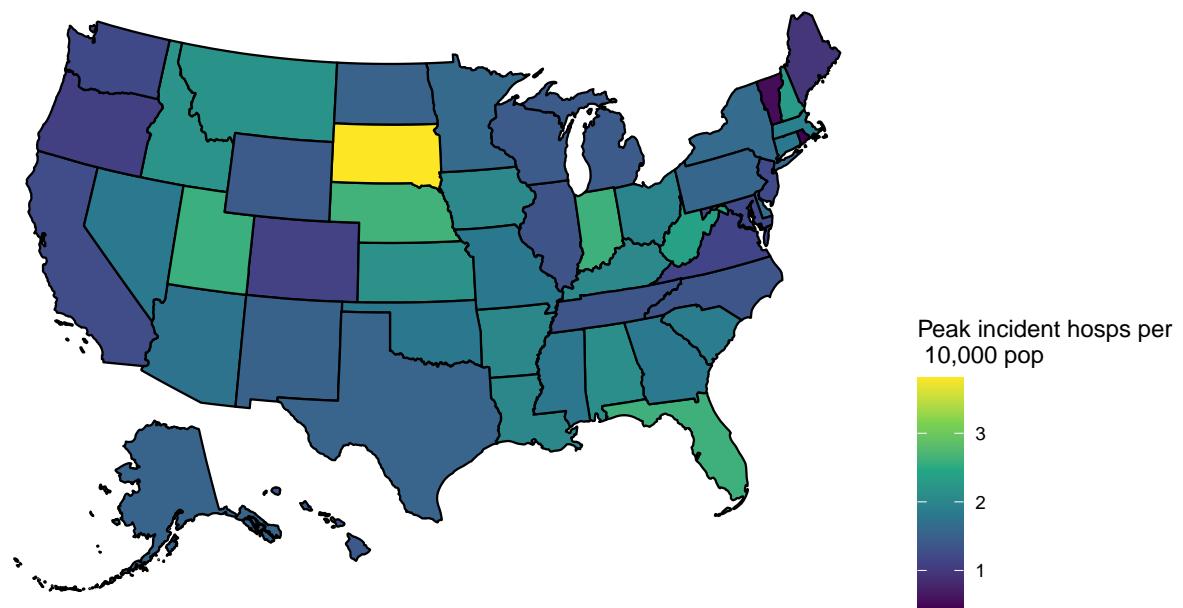


Figure 2: Estimated absolute effects of early vs. late booster campaigns in scenarios with and without a new variant.

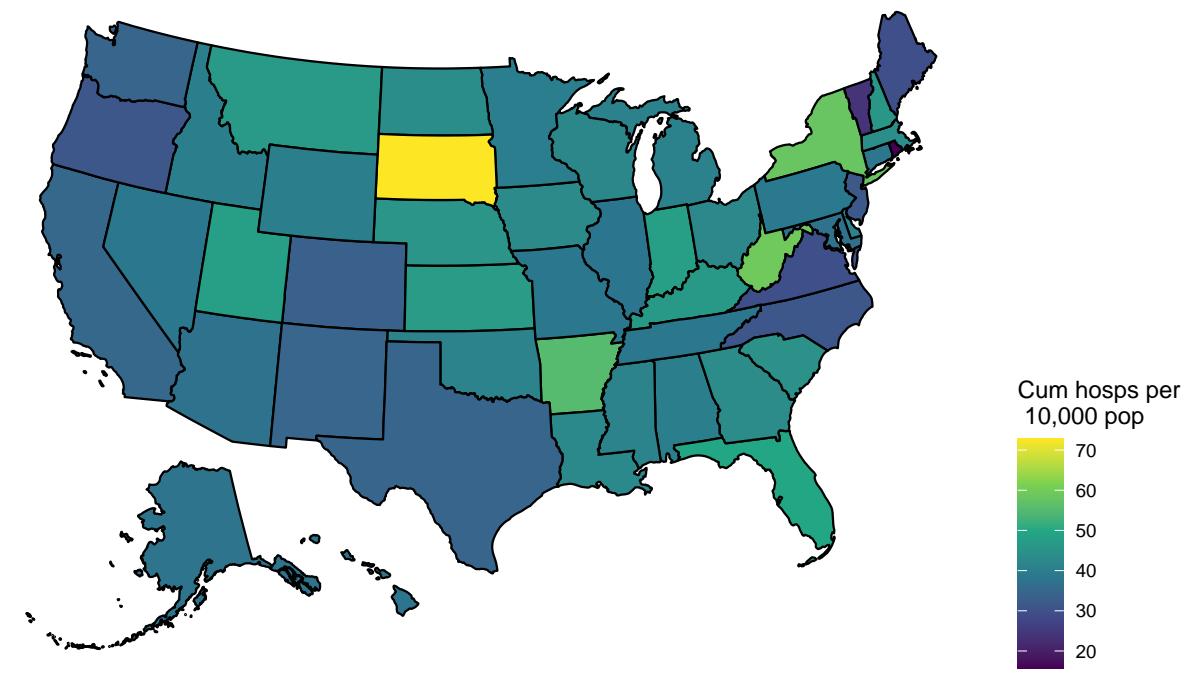


Risk maps

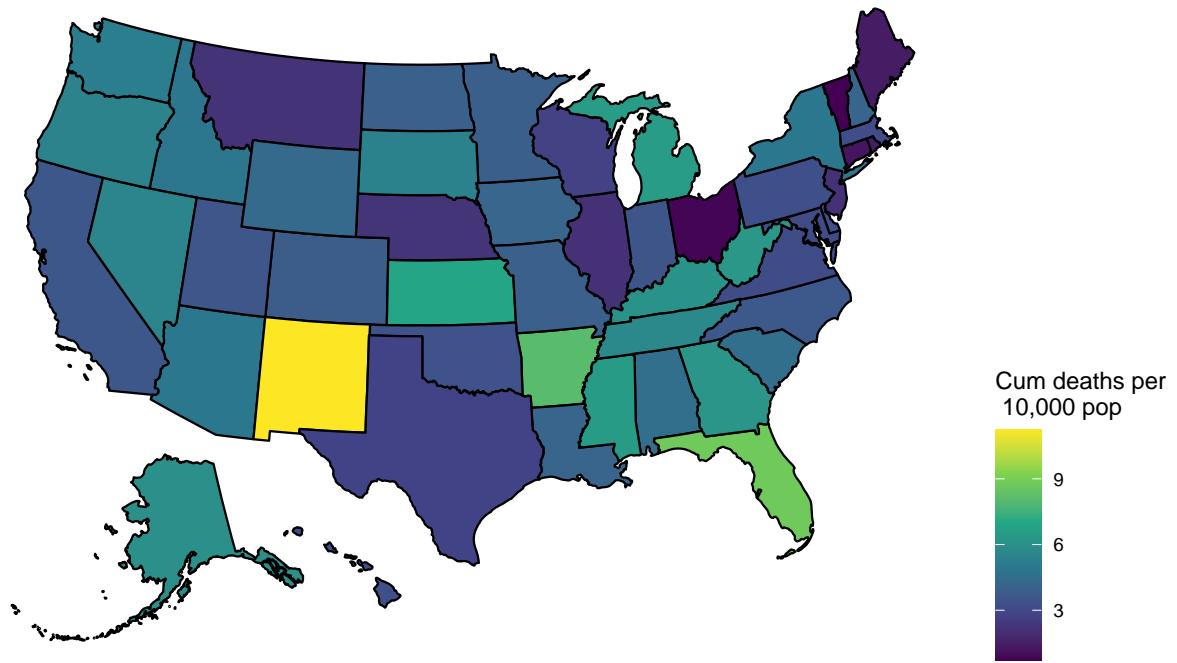
Peak incident reported hospitalizations per 10,000 population in scenario with late booster, and a new variant: July 31, 2022 to May 06, 2023



Cumulative reported hospitalizations per 10,000 population in scenario with late booster, and a new variant: July 31, 2022 to April 22, 2023

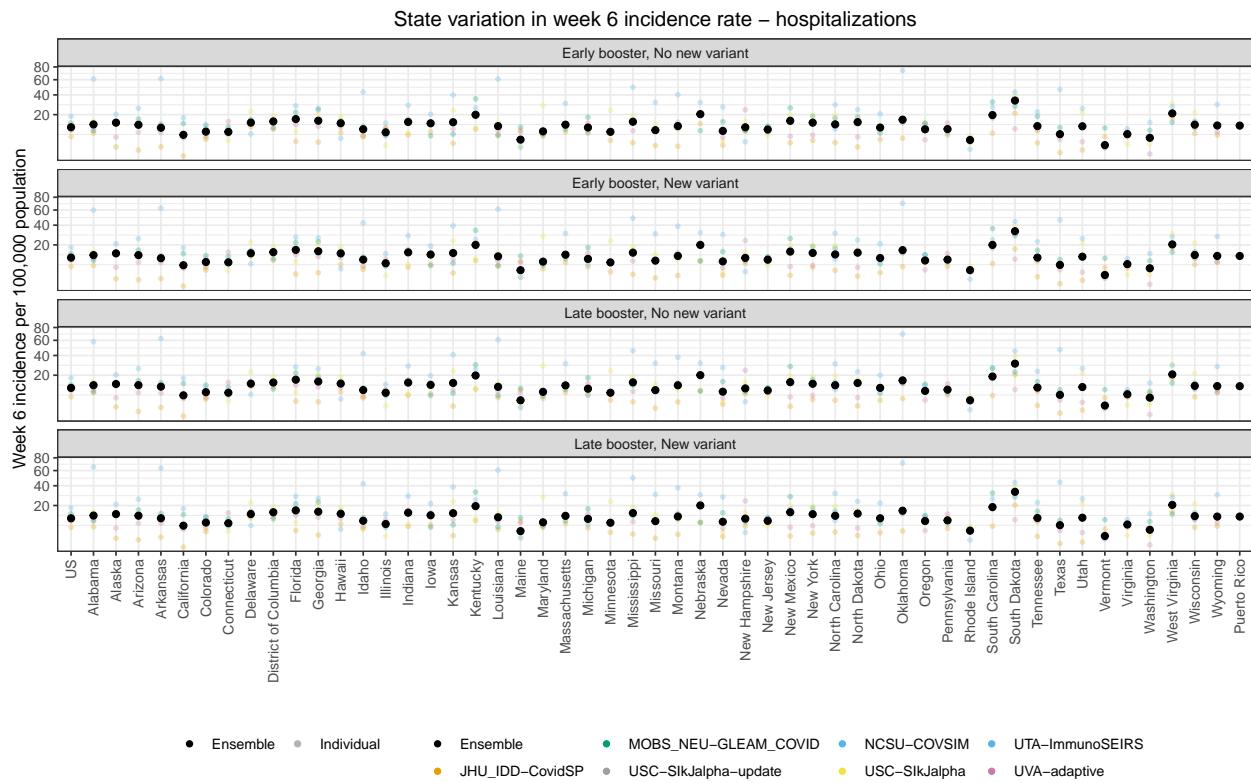


Cumulative deaths per 10,000 population in scenario with late booster,
and a new variant: July 31, 2022 to April 22, 2023

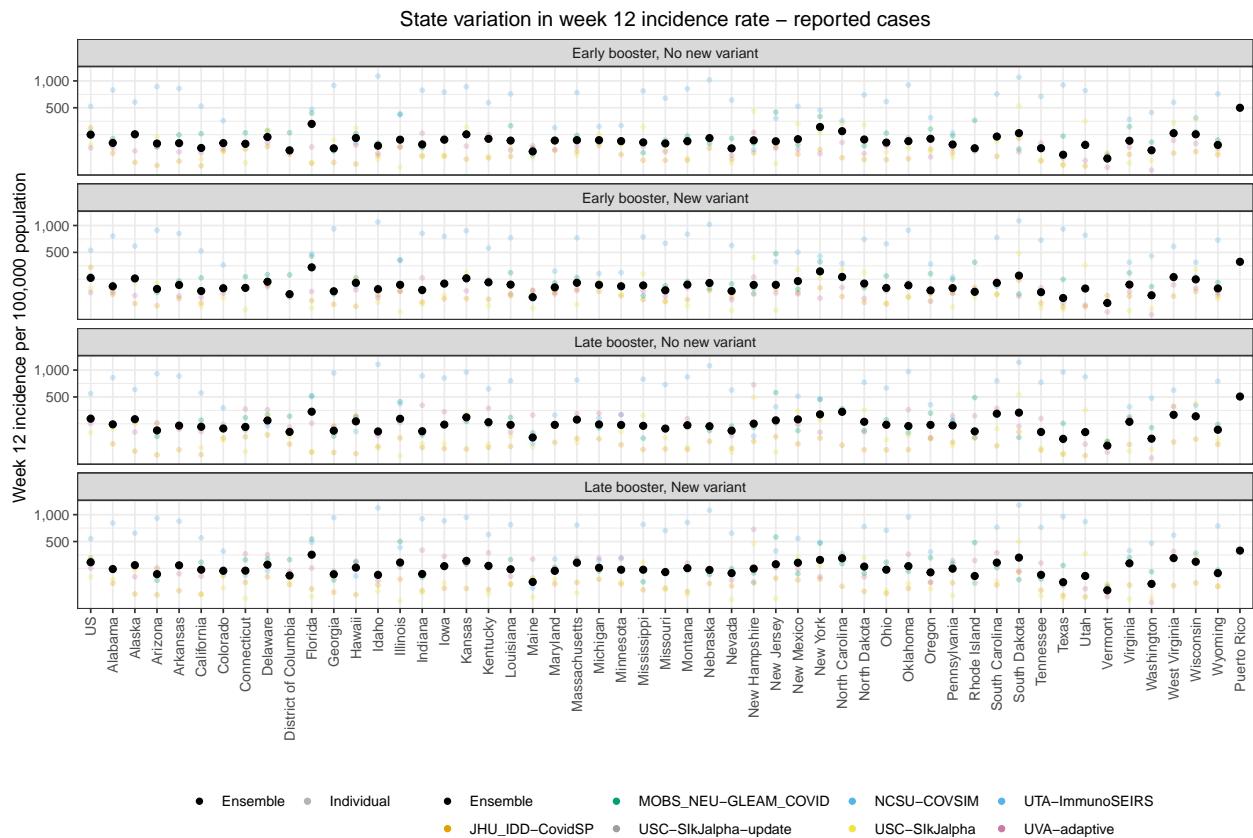


State-level deviation from national

Individual model and ensembles projections for state-level hospitalization incidence per 100,000 population at week 6.



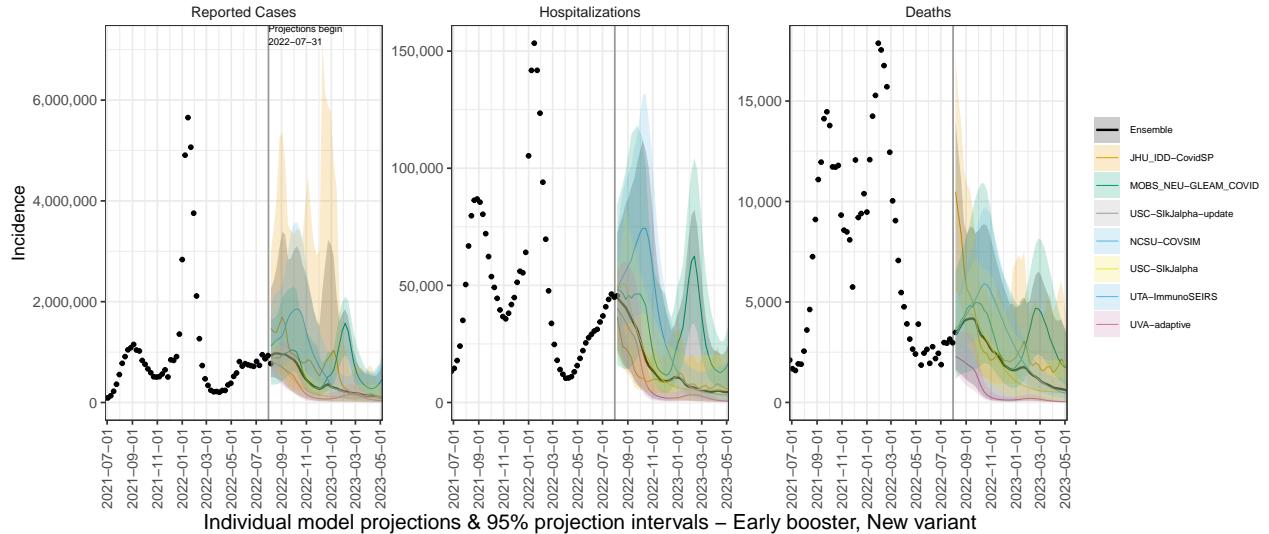
Individual model and ensembles projections for state-level incidence per 100,000 population at week 12.



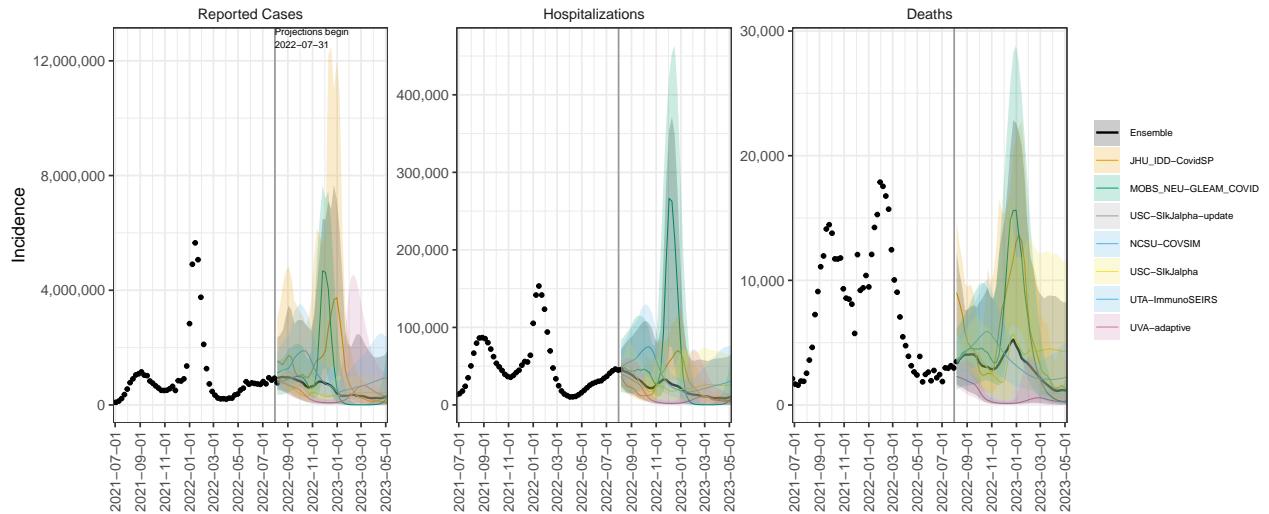
National model variation

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

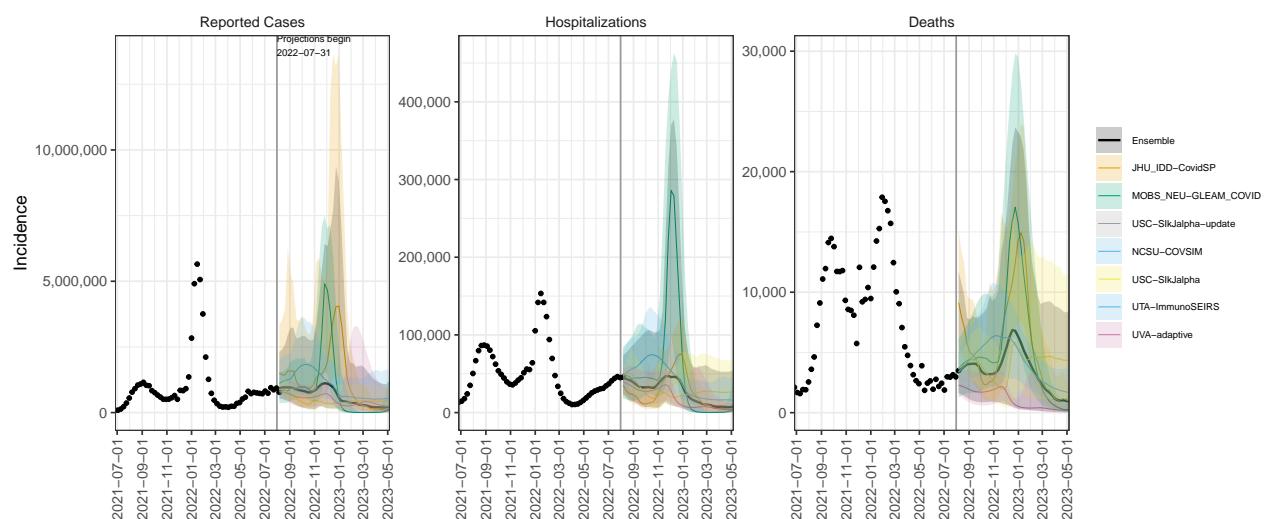
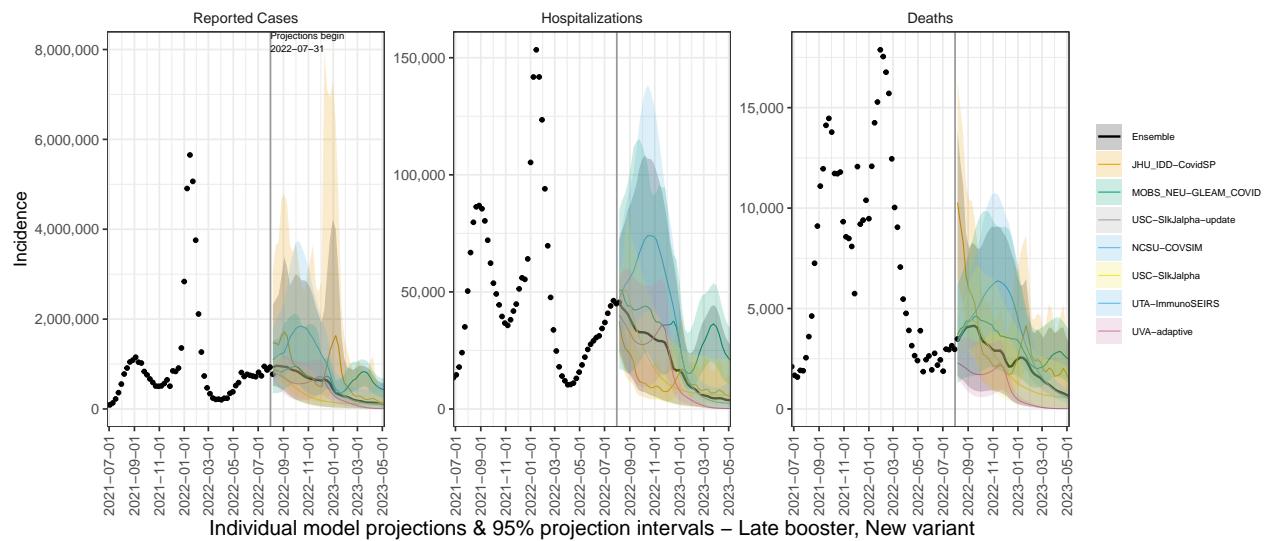
Individual model projections & 95% projection intervals – Early booster, No new variant



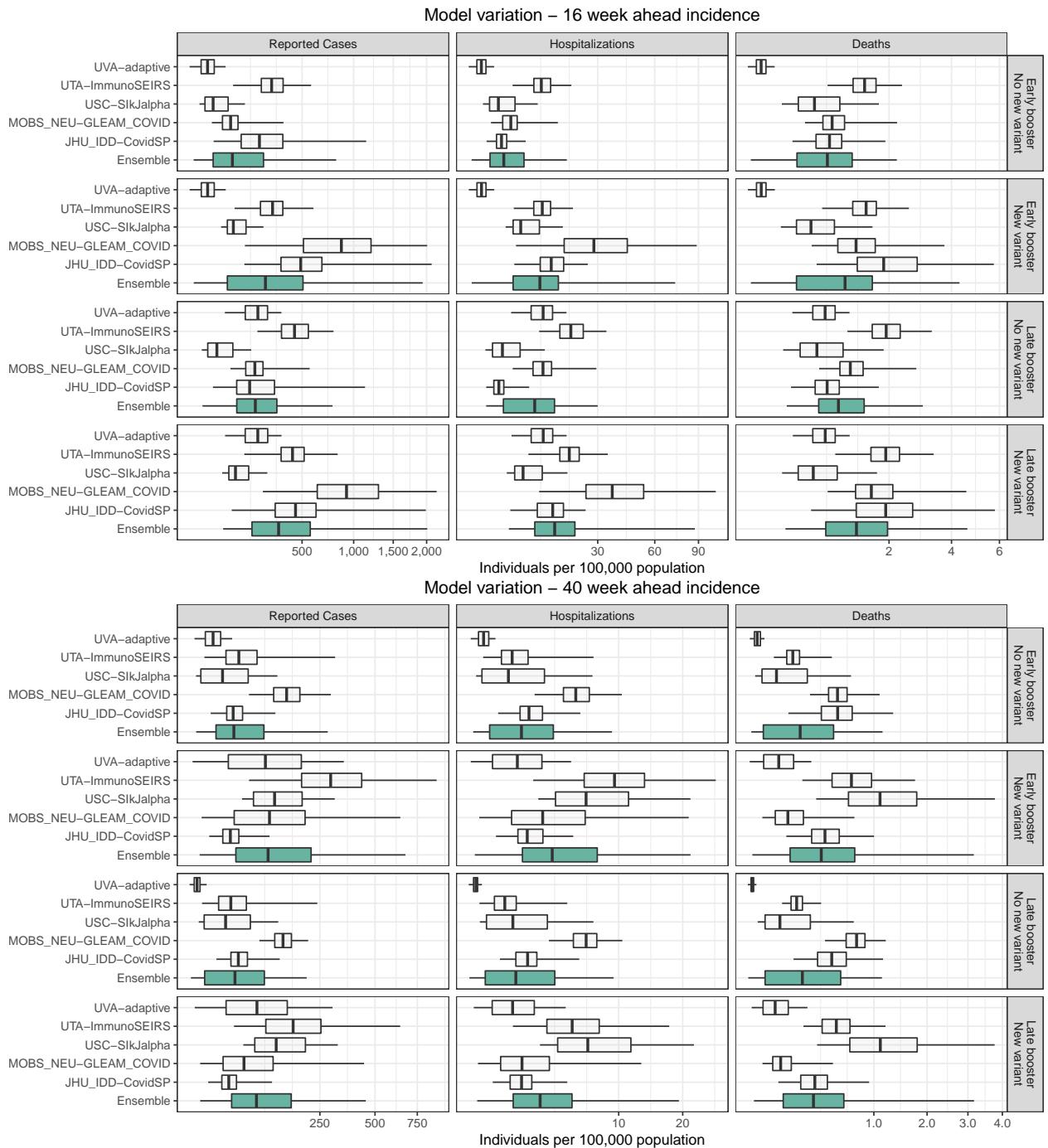
Individual model projections & 95% projection intervals – Early booster, New variant



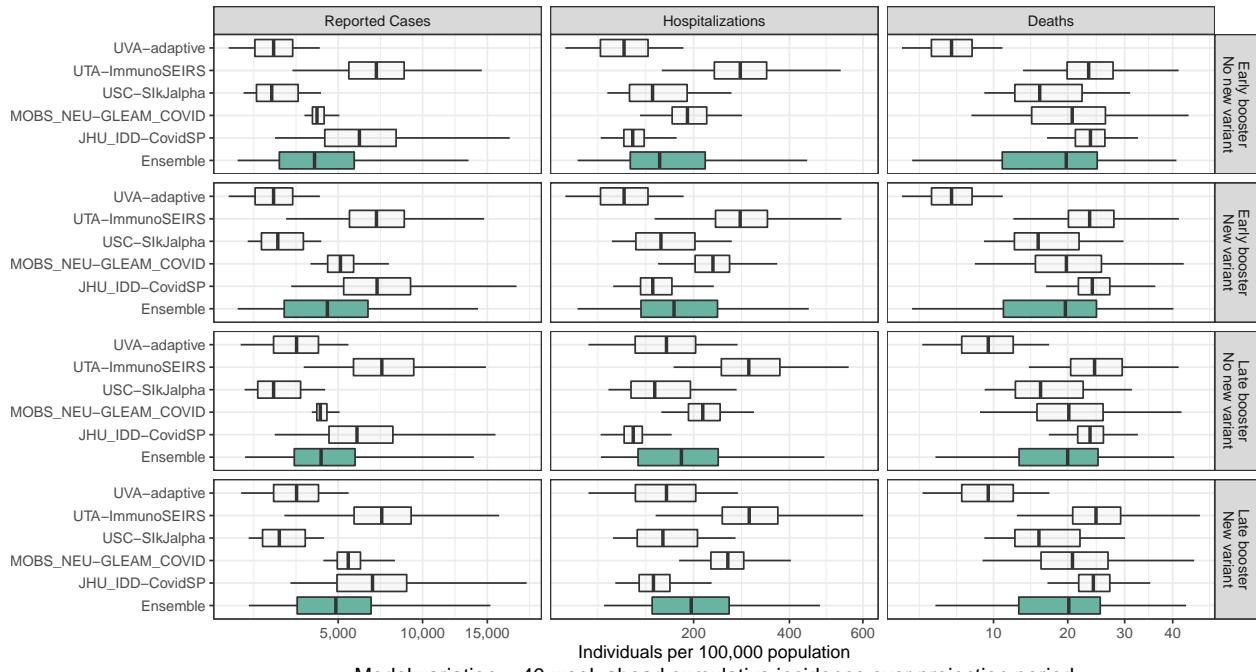
Individual model projections & 95% projection intervals – Late booster, No new variant



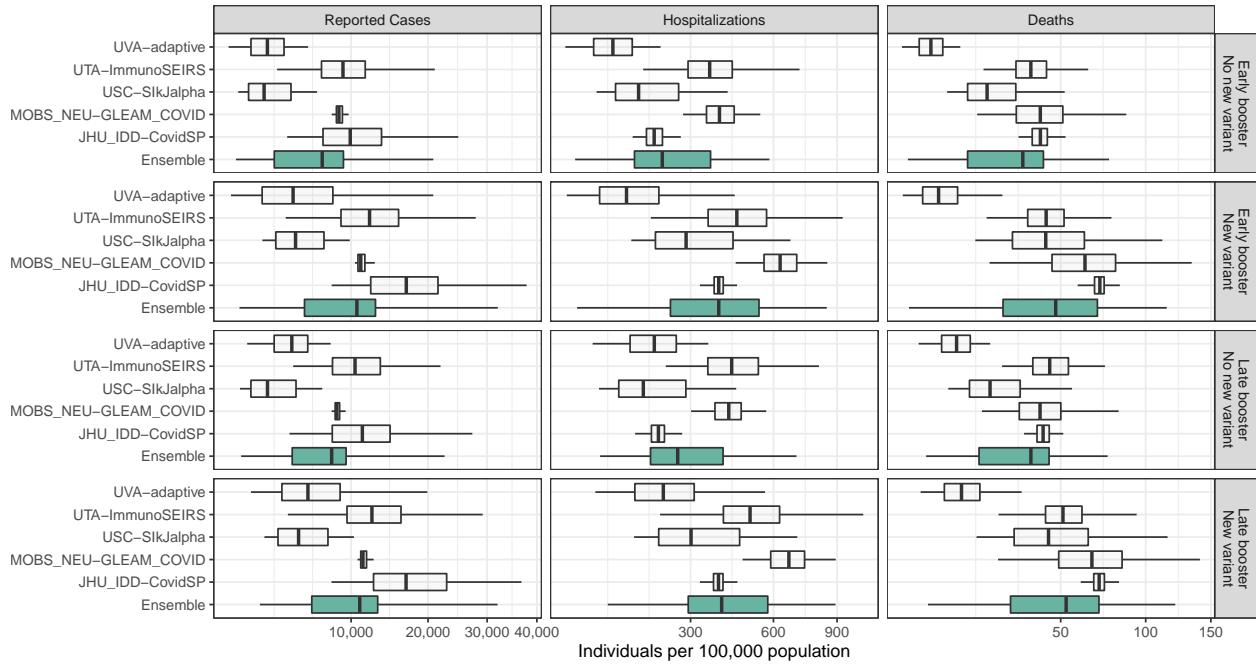
Projection distributions



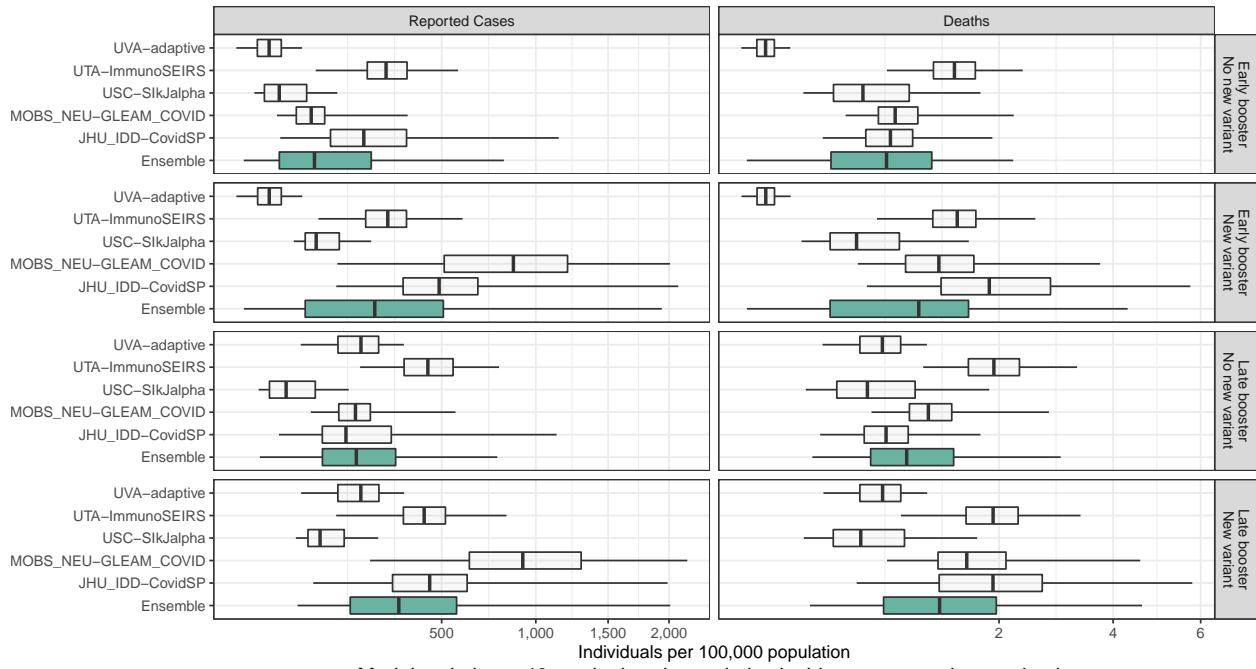
Model variation – 16 week ahead cumulative incidence over projection period



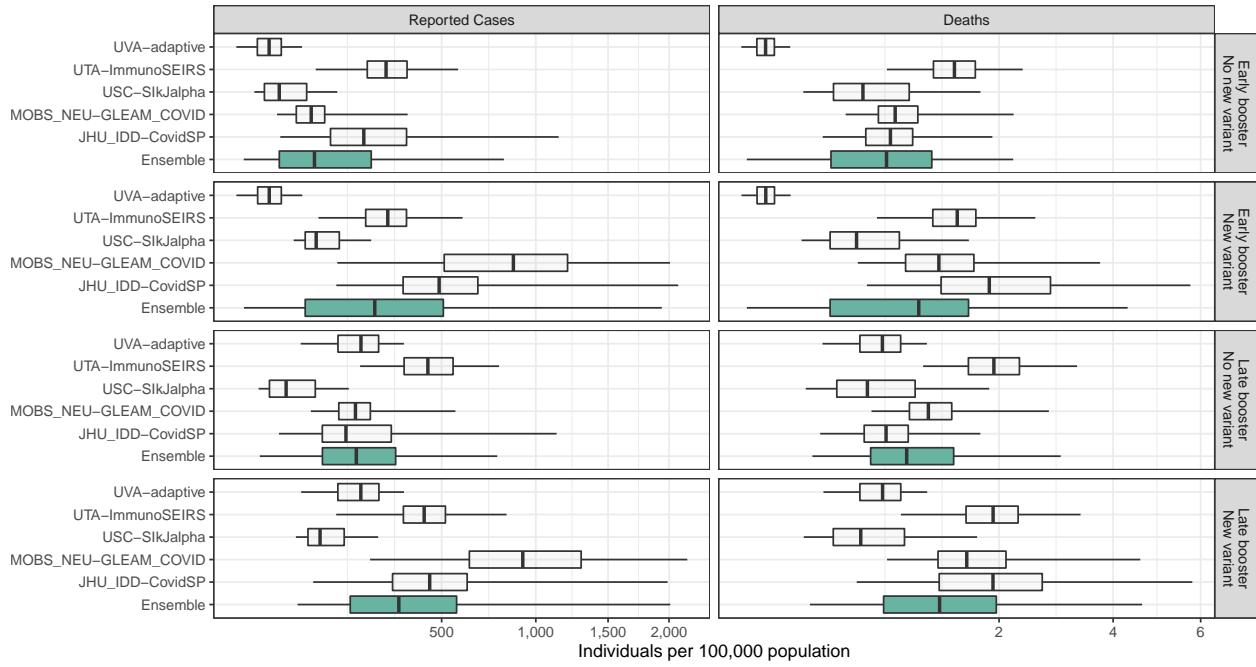
Model variation – 40 week ahead cumulative incidence over projection period



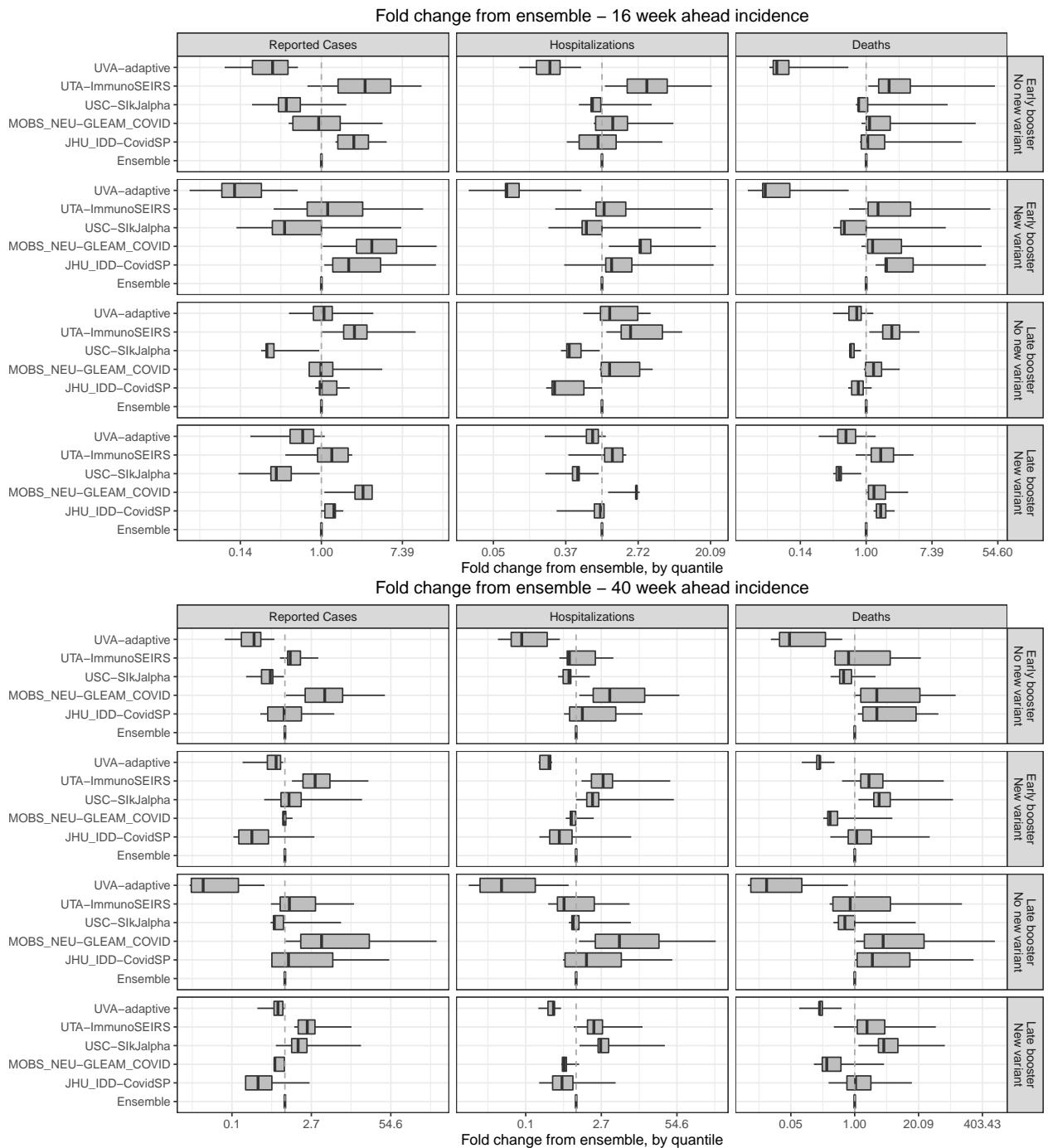
Model variation – 16 week ahead cumulative incidence over entire pandemic



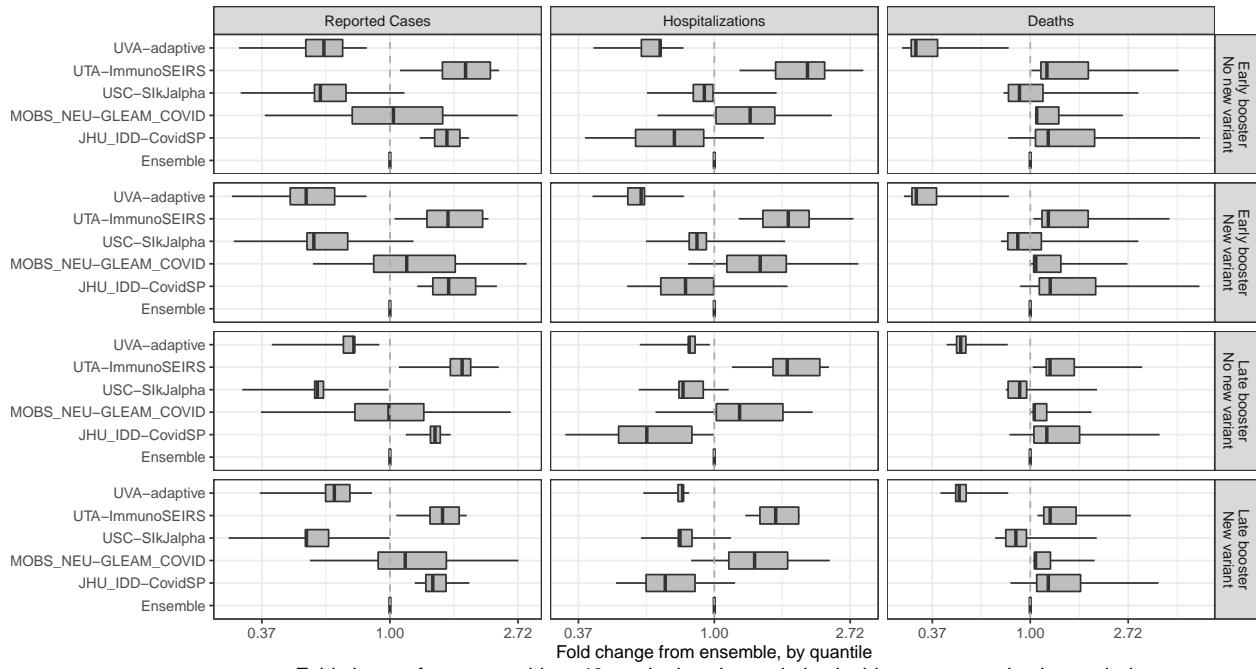
Model variation – 40 week ahead cumulative incidence over entire pandemic



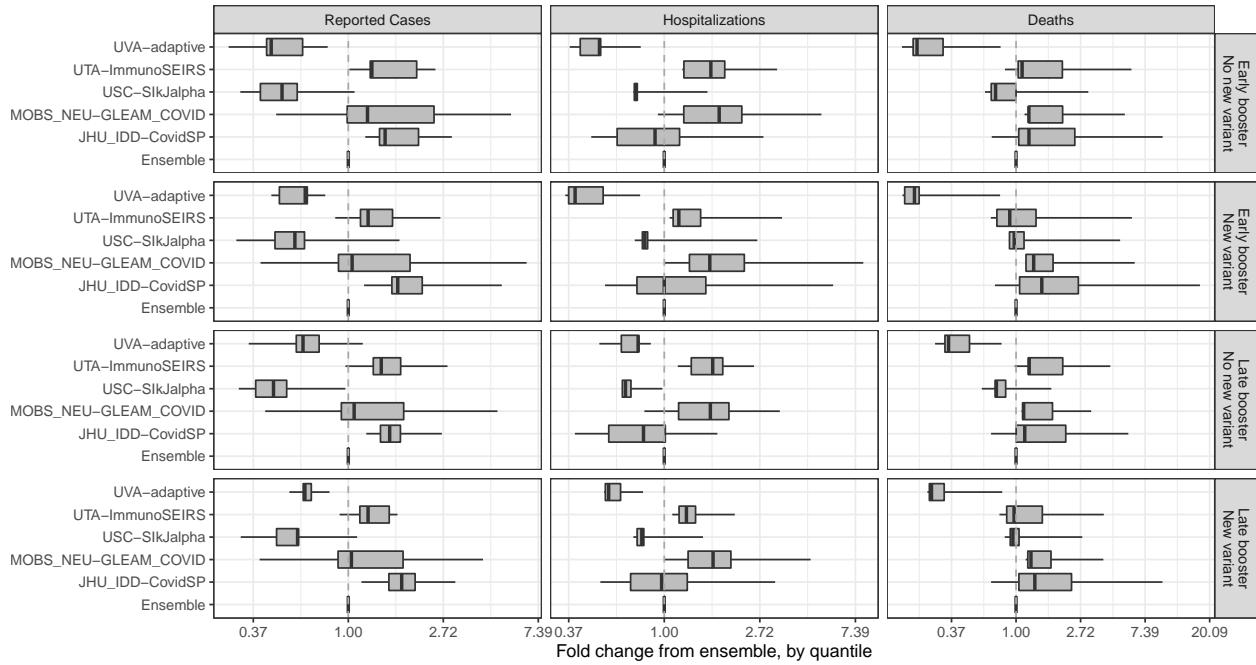
Difference between model and ensemble distributions



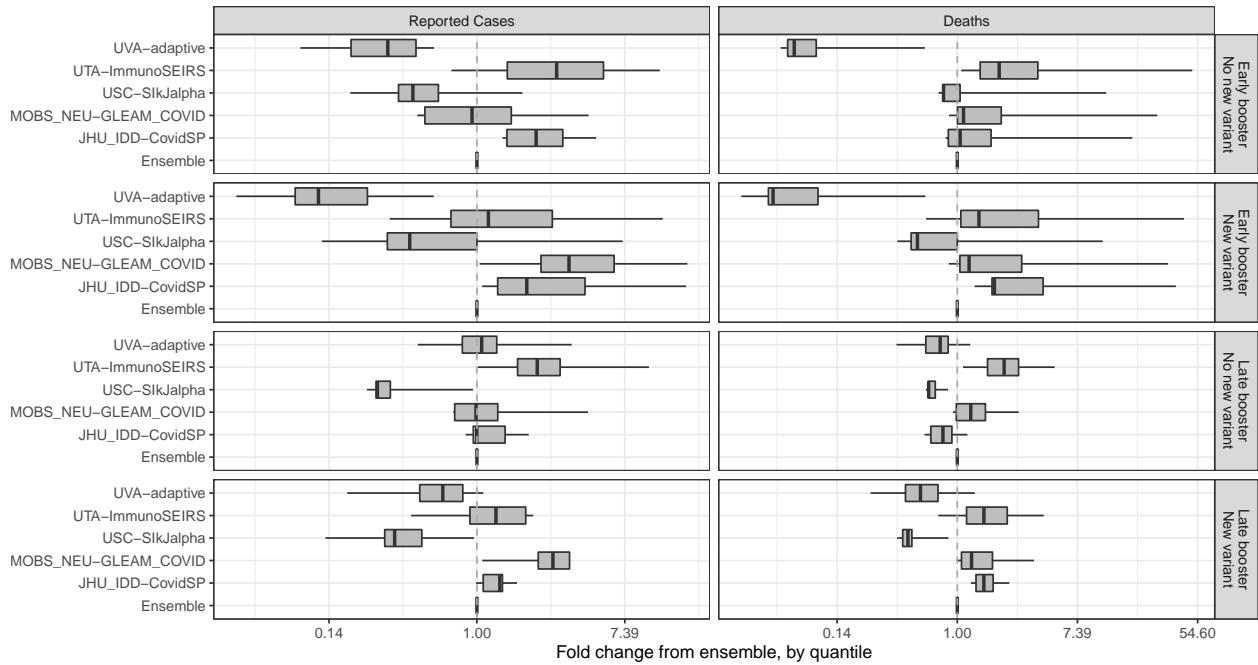
Fold change from ensemble – 16 week ahead cumulative incidence over projection period



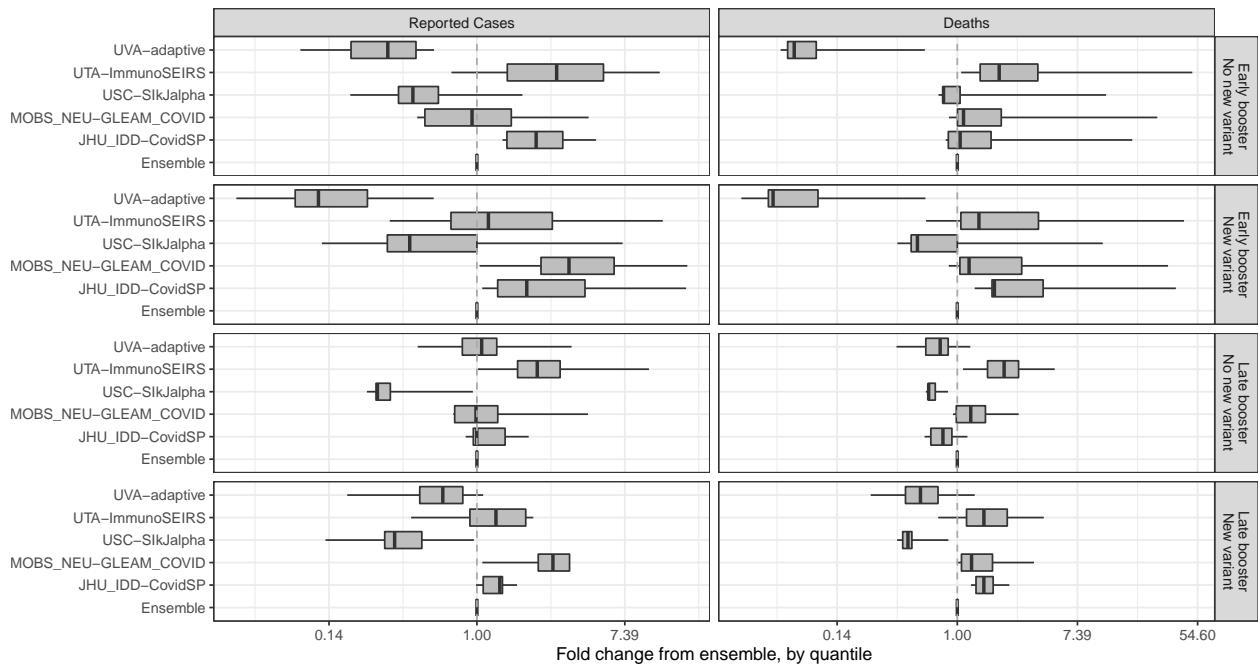
Fold change from ensemble – 40 week ahead cumulative incidence over projection period



Fold change from ensemble – 16 week ahead cumulative incidence over entire pandemic



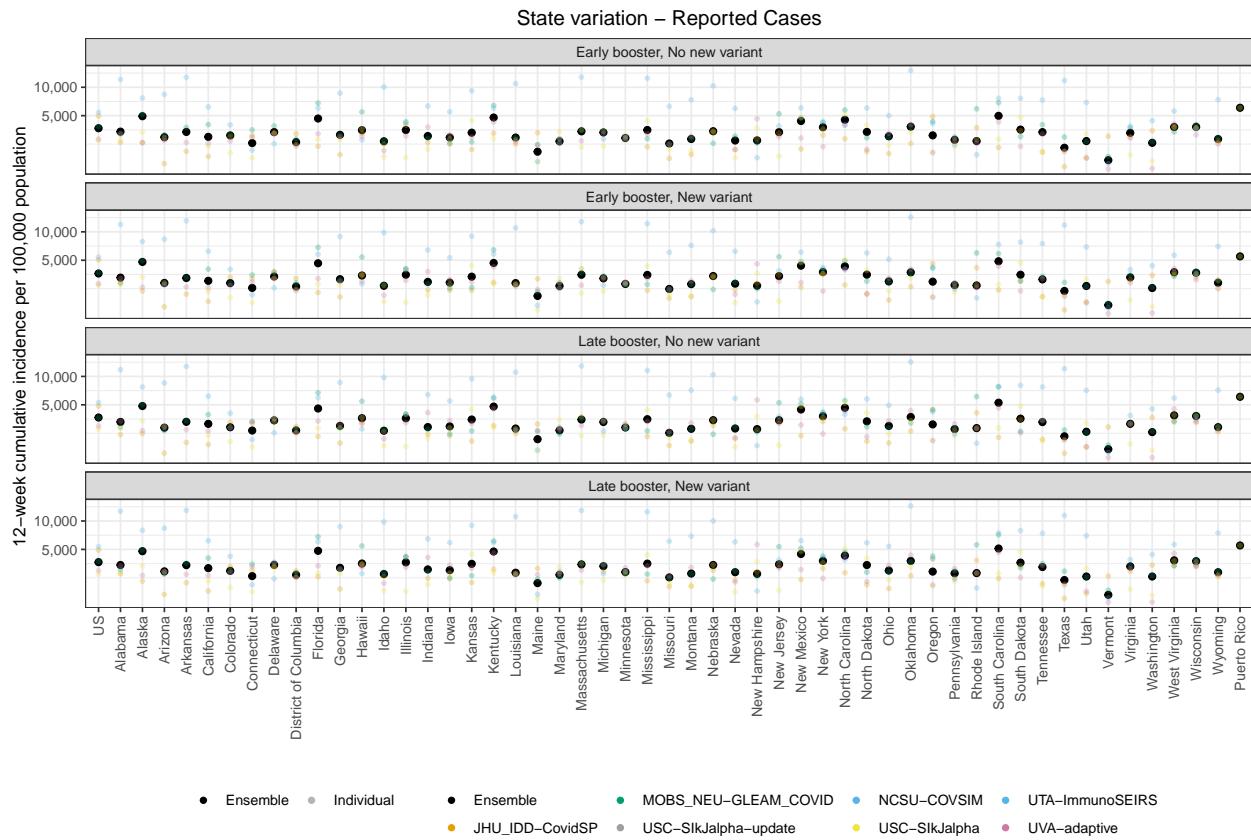
Fold change from ensemble – 40 week ahead cumulative incidence over entire pandemic



Model Abstracts

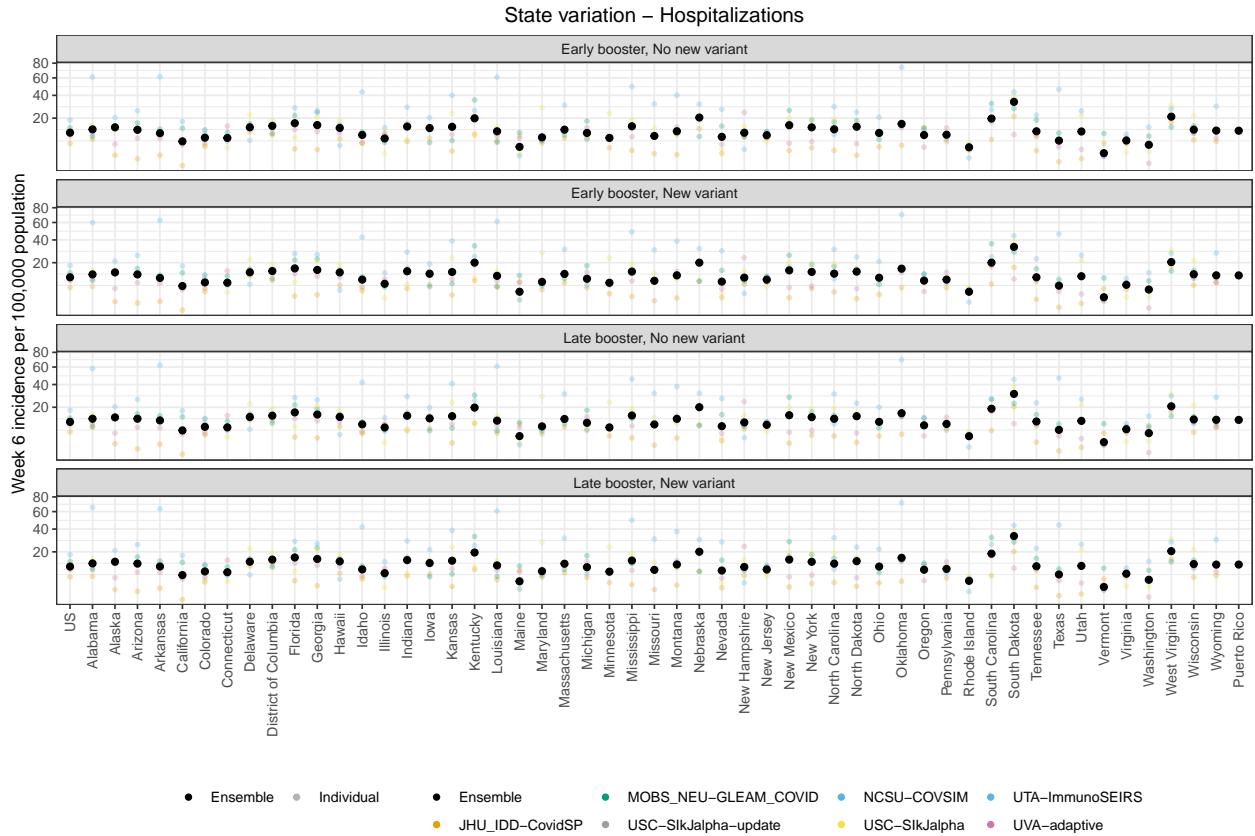
Supplemental Plots

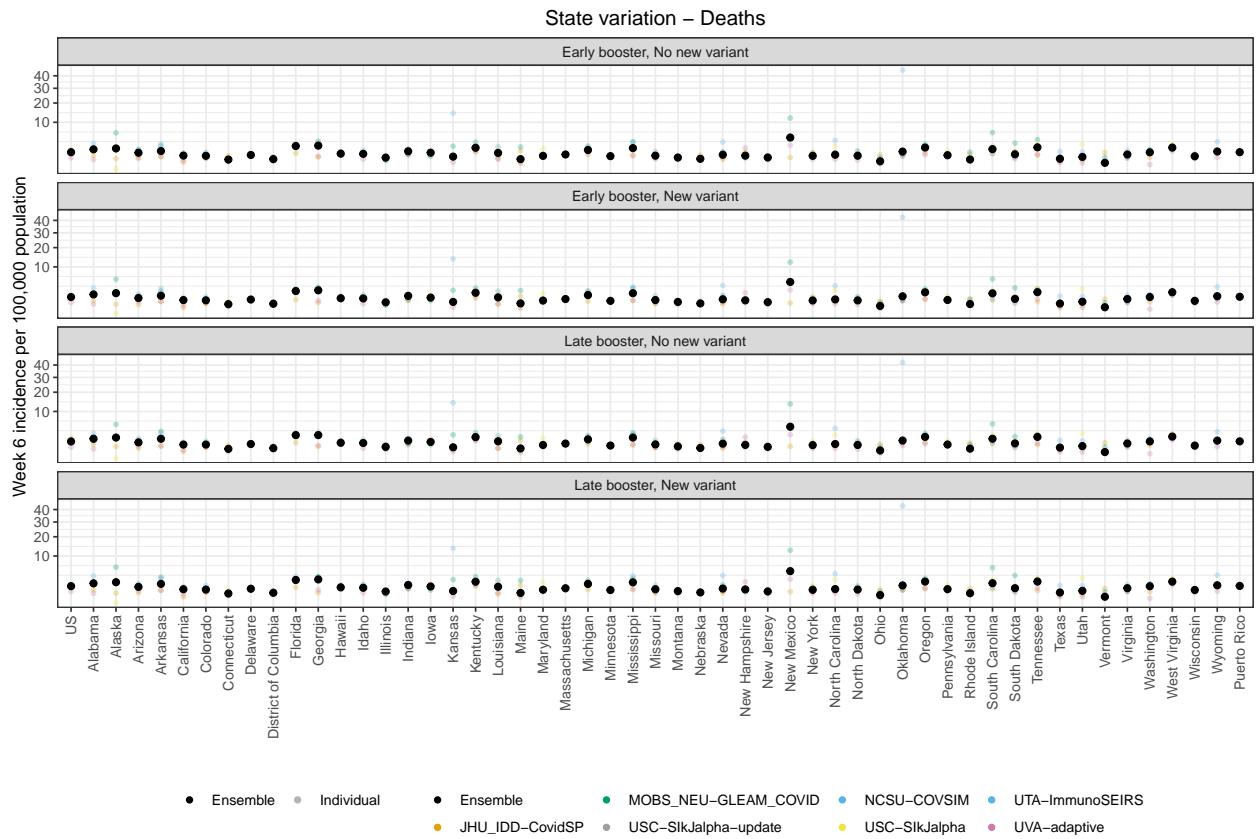
Individual model and ensembles projections for state-level cumulative incidence per 100,000 population over 12-week projection period.



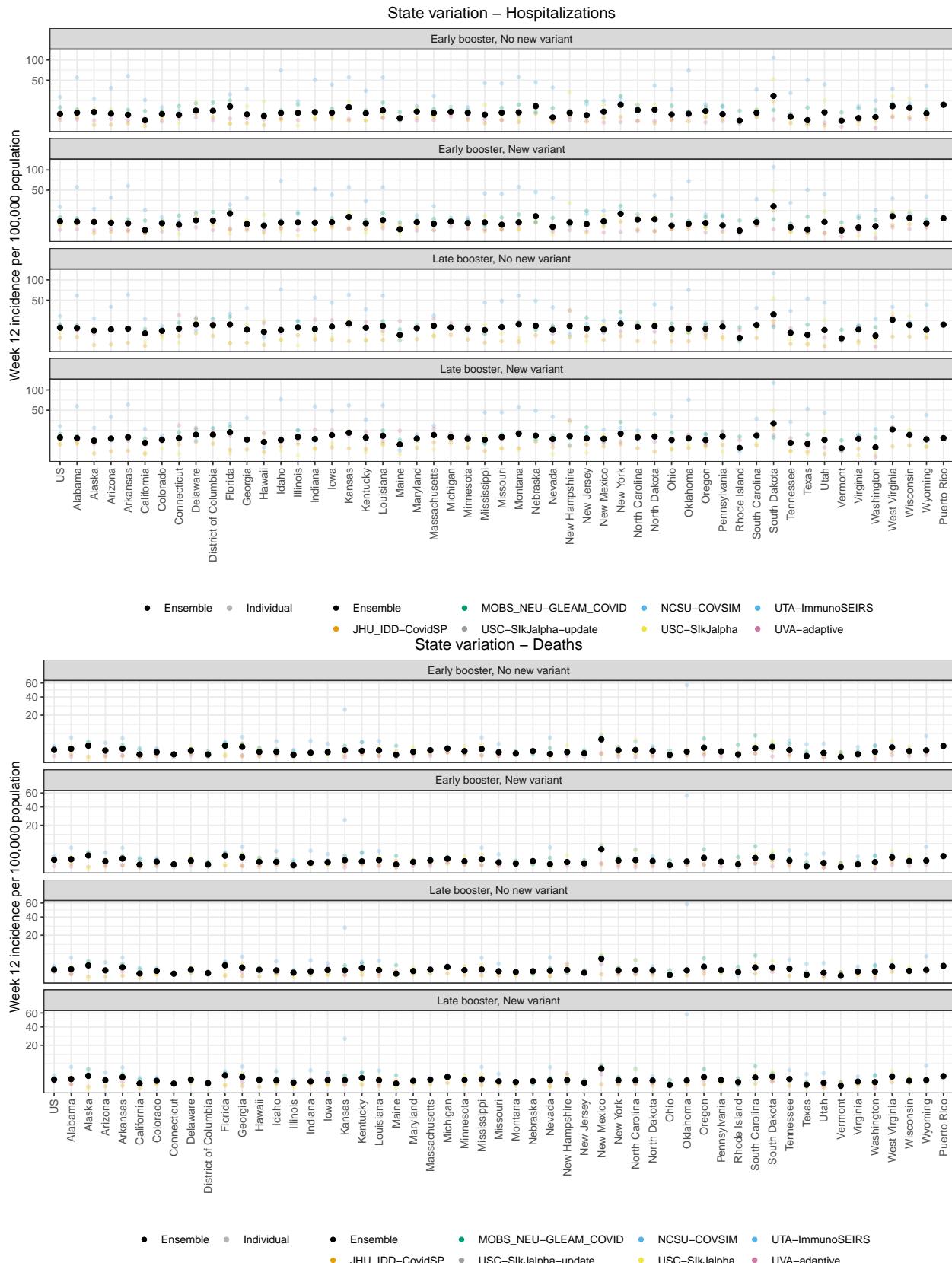


Individual model and ensembles projections for state-level death and hospitalization incidence per 100,000 population at week 6.



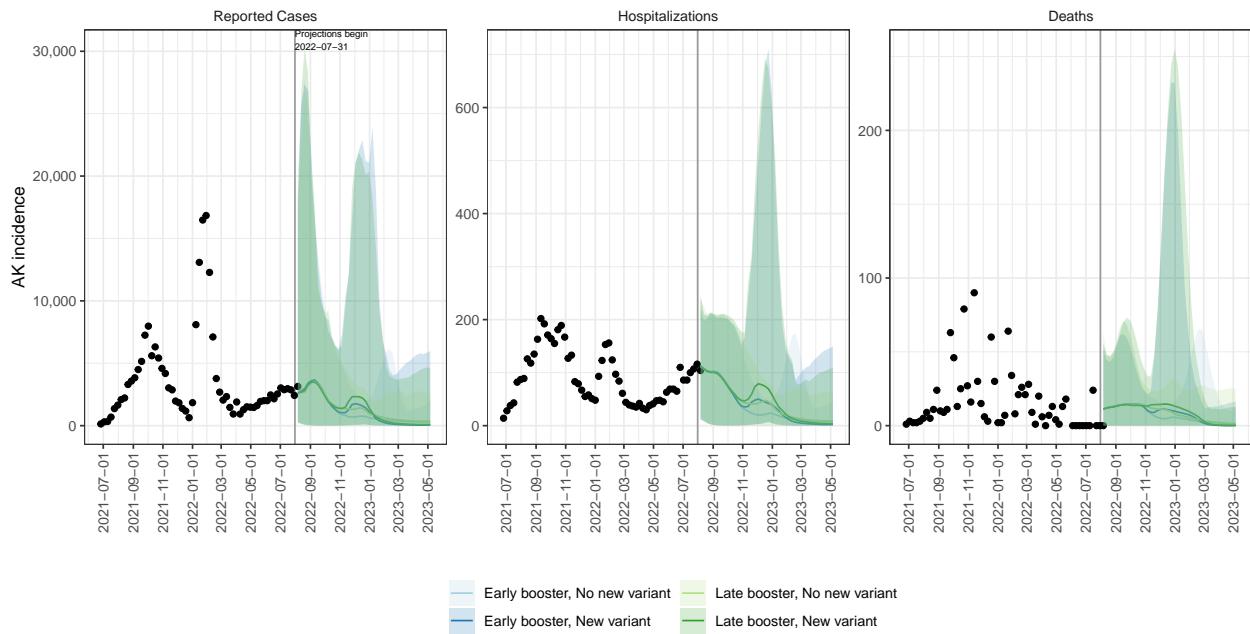
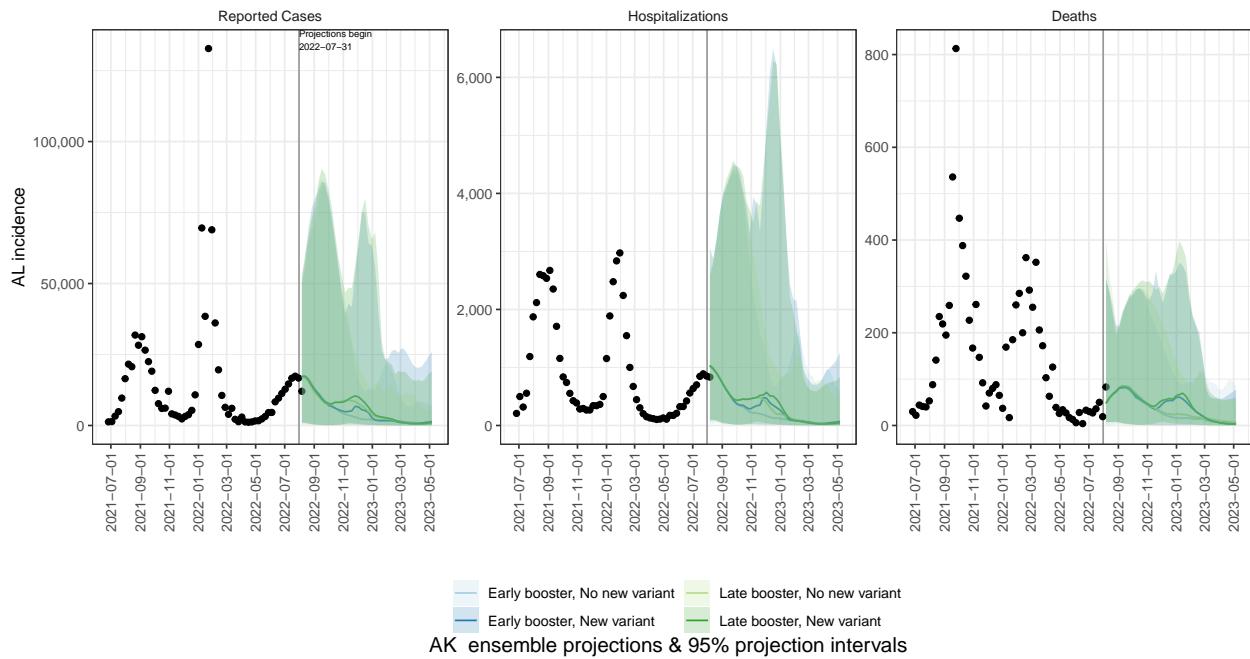


Individual model and ensembles projections for state-level incidence per 100,000 population at week 12.

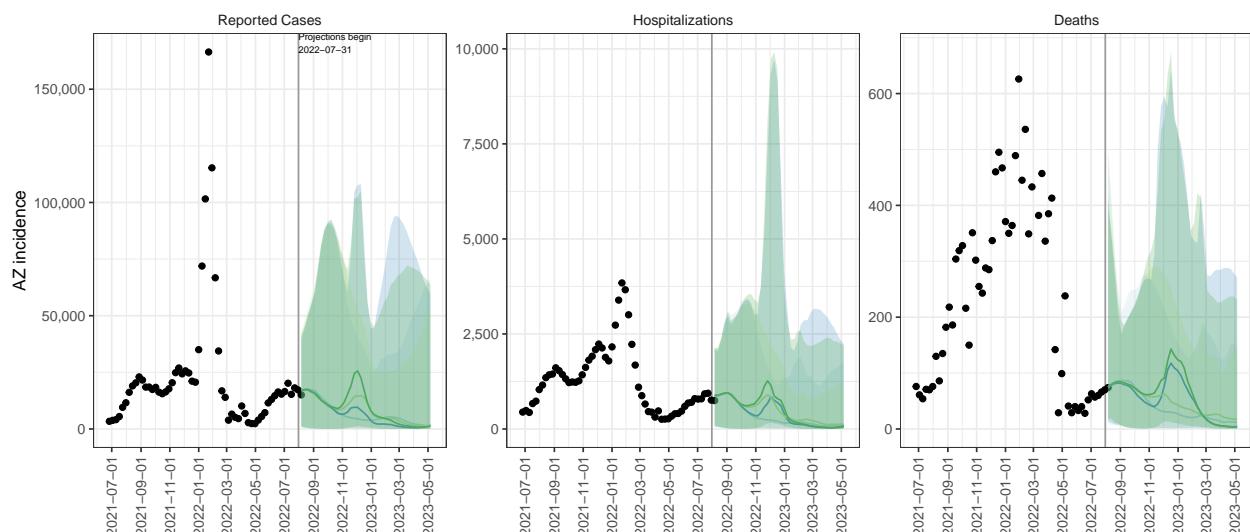


State-level ensemble plots

AL ensemble projections & 95% projection intervals

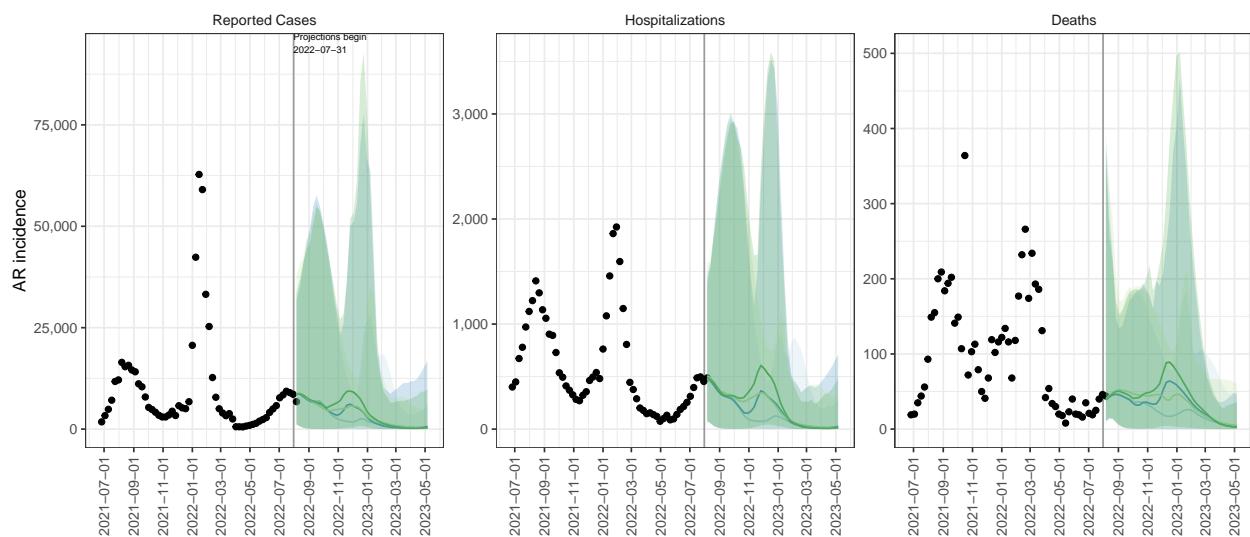


AZ ensemble projections & 95% projection intervals



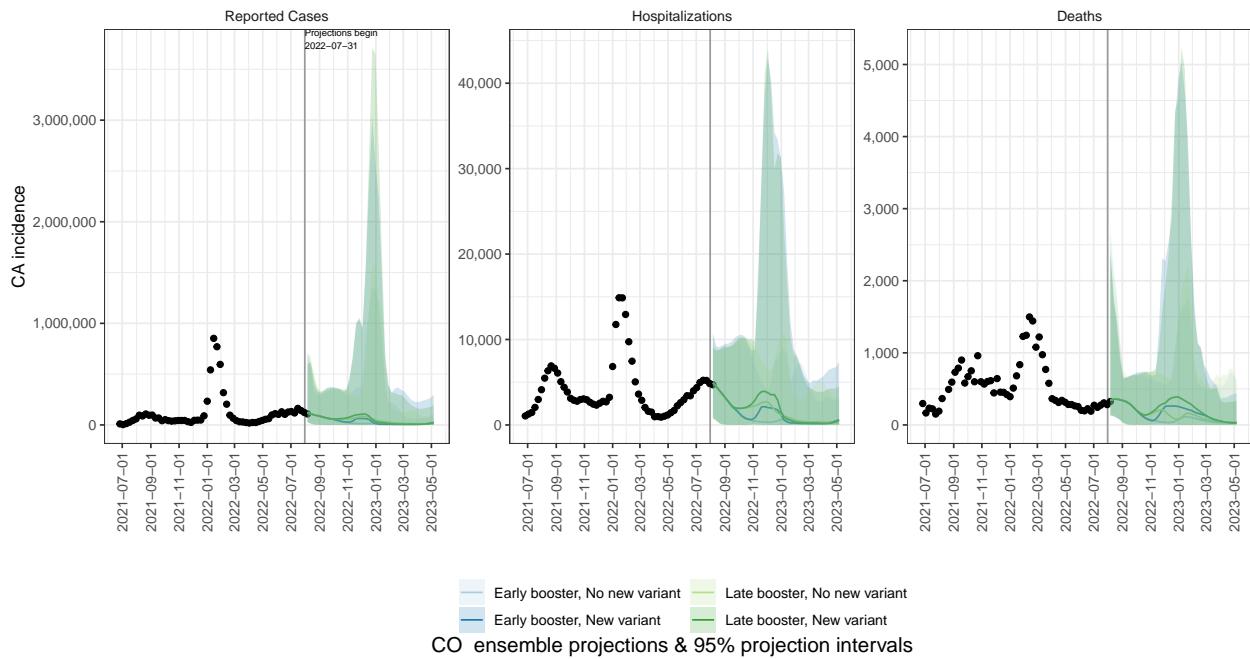
Early booster, No new variant	Late booster, No new variant
Early booster, New variant	Late booster, New variant

AR ensemble projections & 95% projection intervals

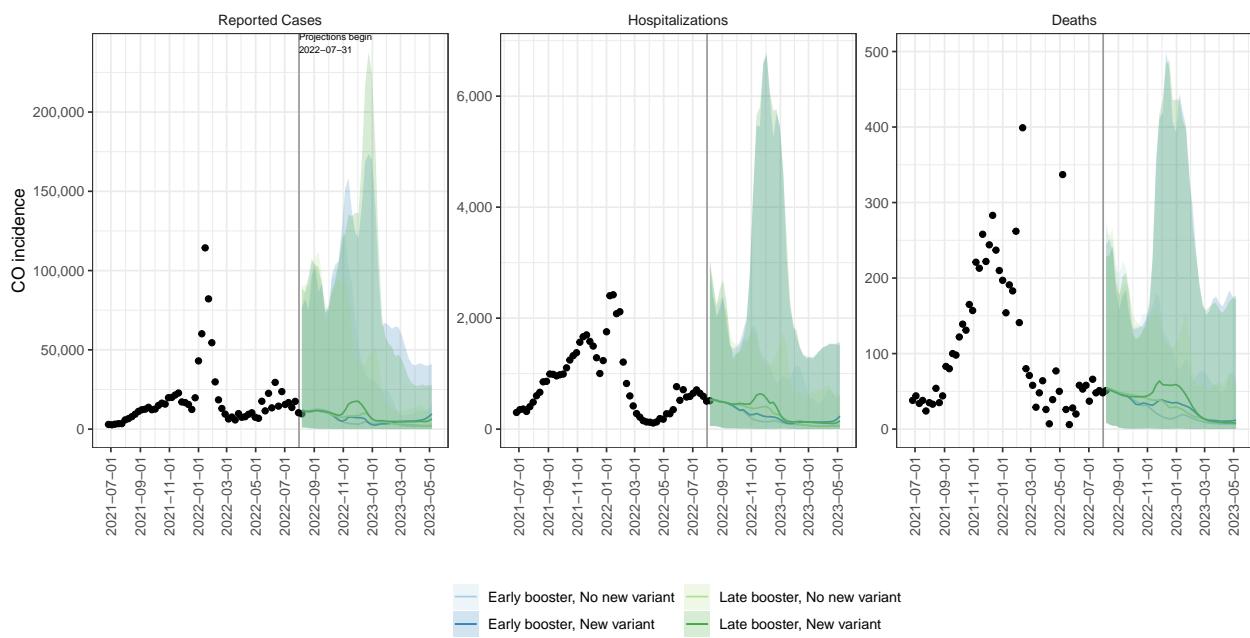


Early booster, No new variant	Late booster, No new variant
Early booster, New variant	Late booster, New variant

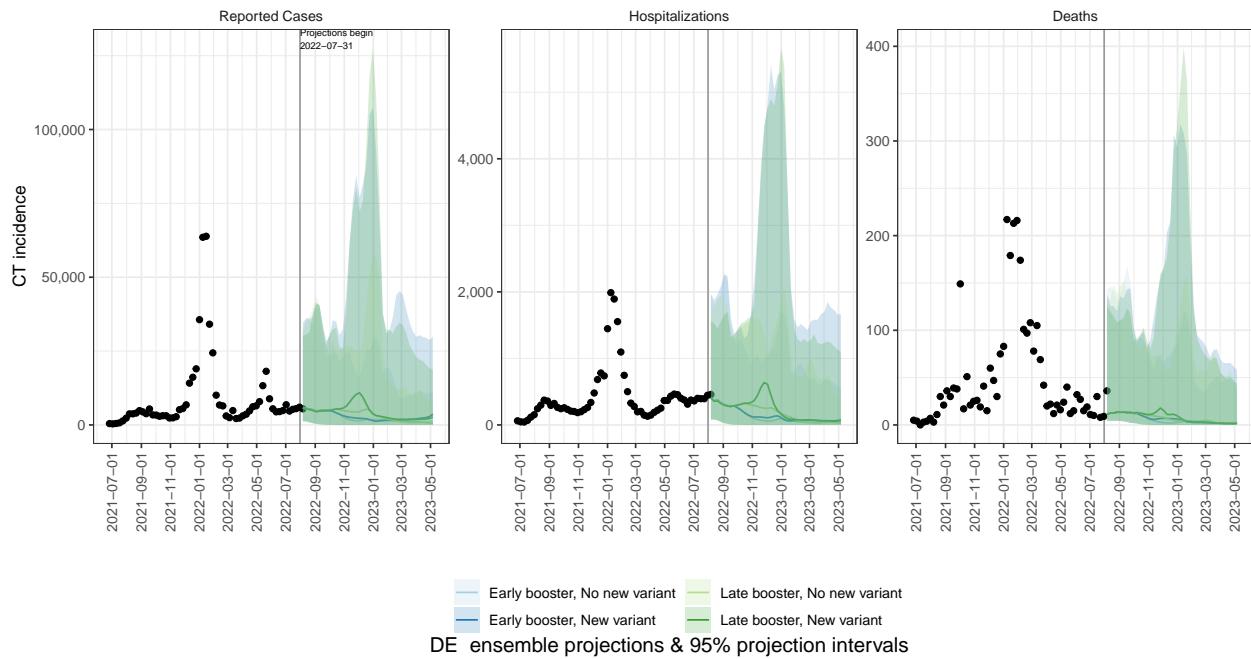
CA ensemble projections & 95% projection intervals



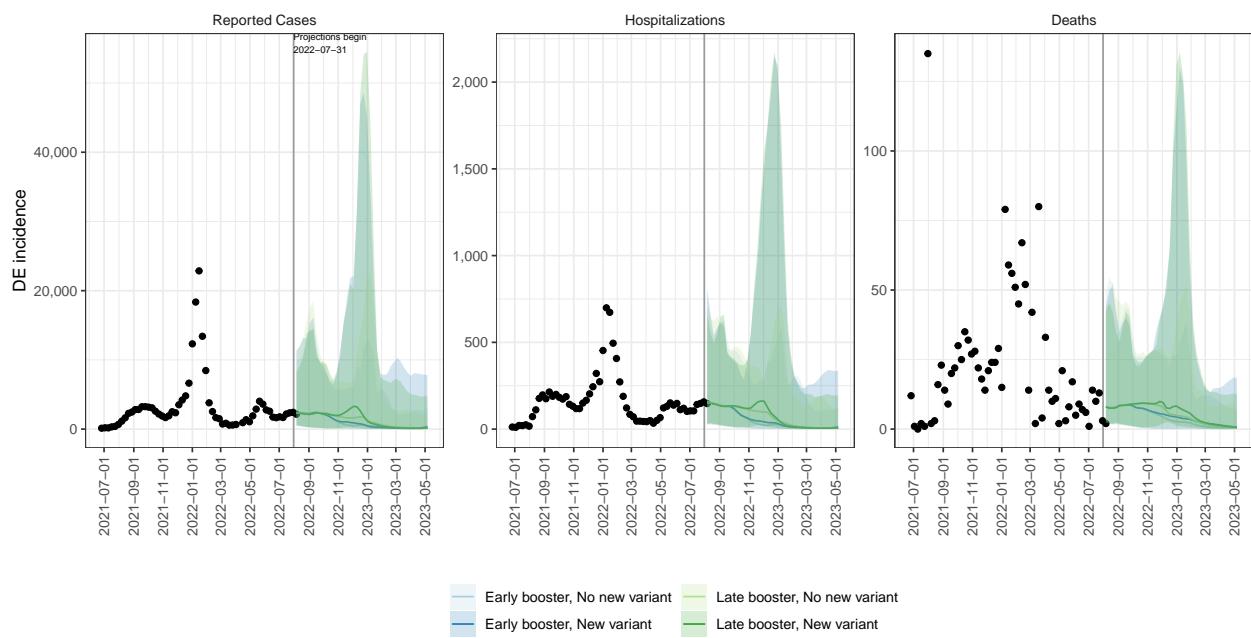
CO ensemble projections & 95% projection intervals



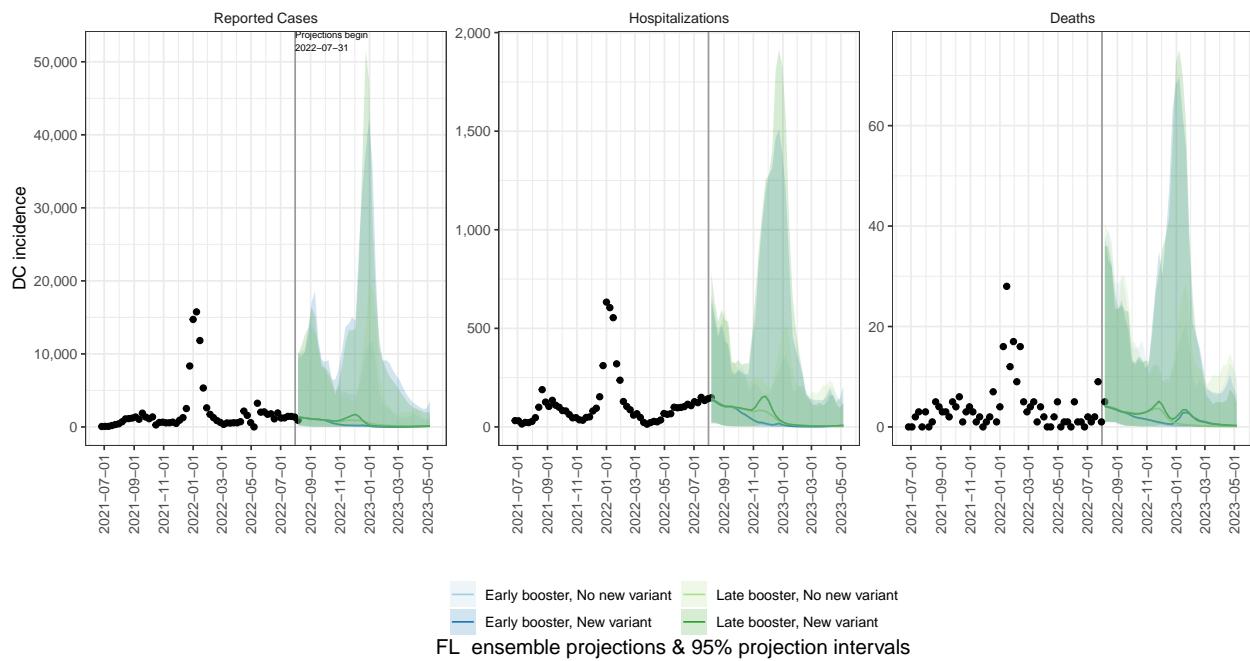
CT ensemble projections & 95% projection intervals



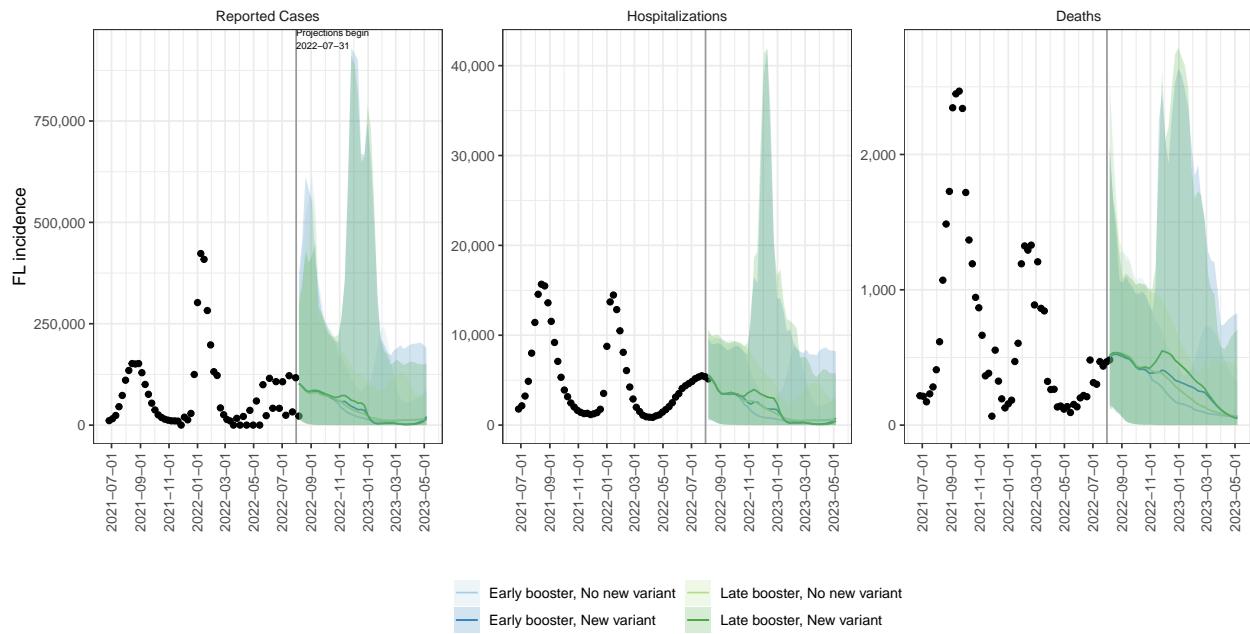
DE ensemble projections & 95% projection intervals



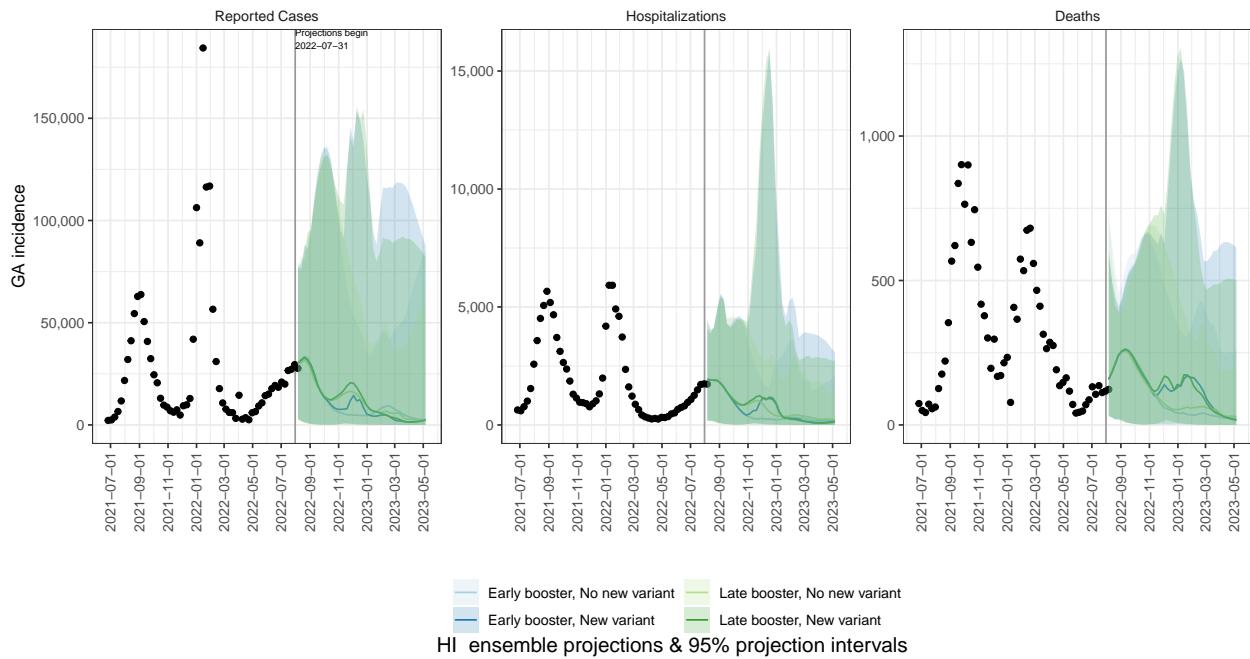
DC ensemble projections & 95% projection intervals



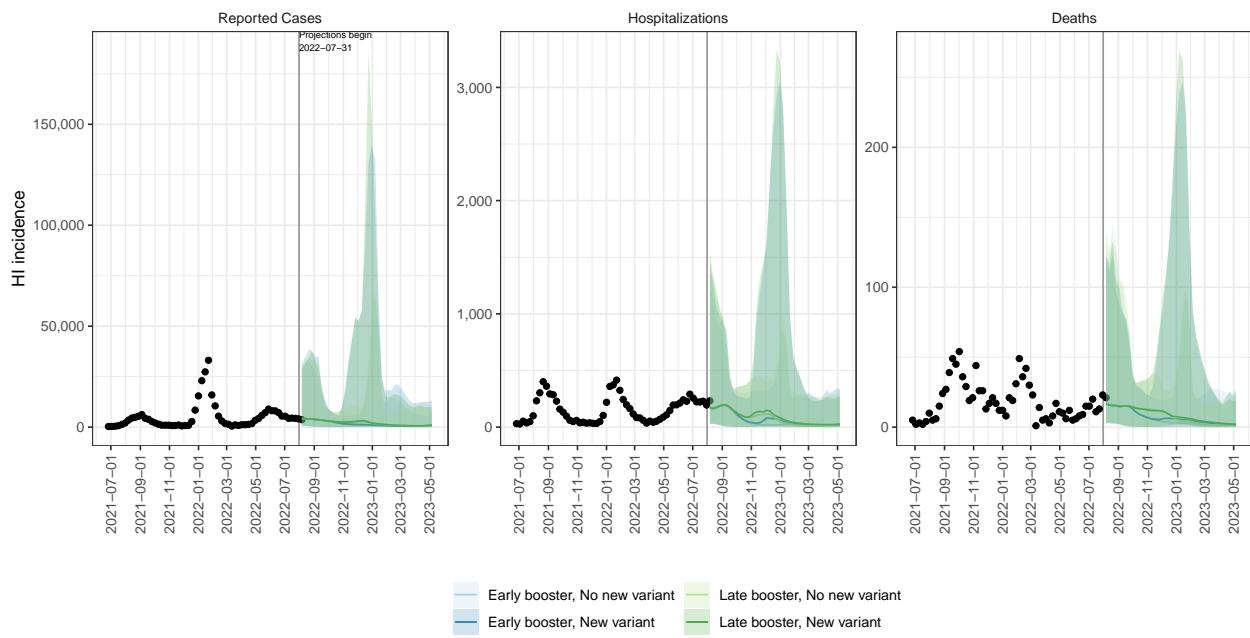
FL ensemble projections & 95% projection intervals



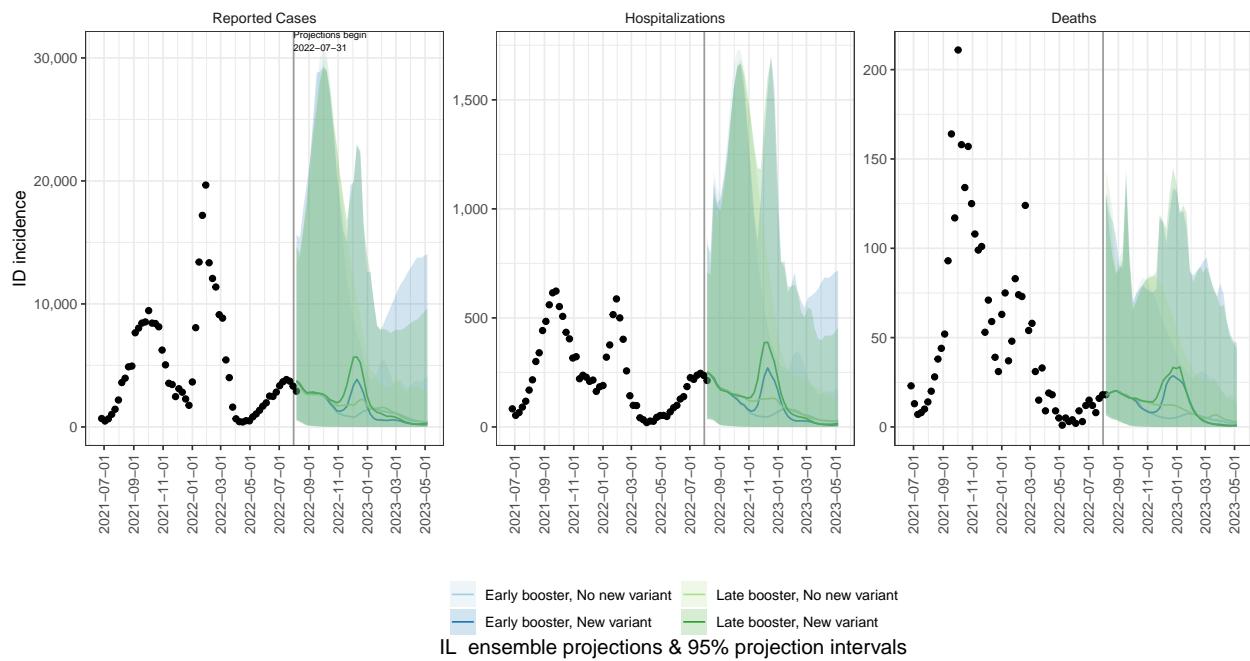
GA ensemble projections & 95% projection intervals



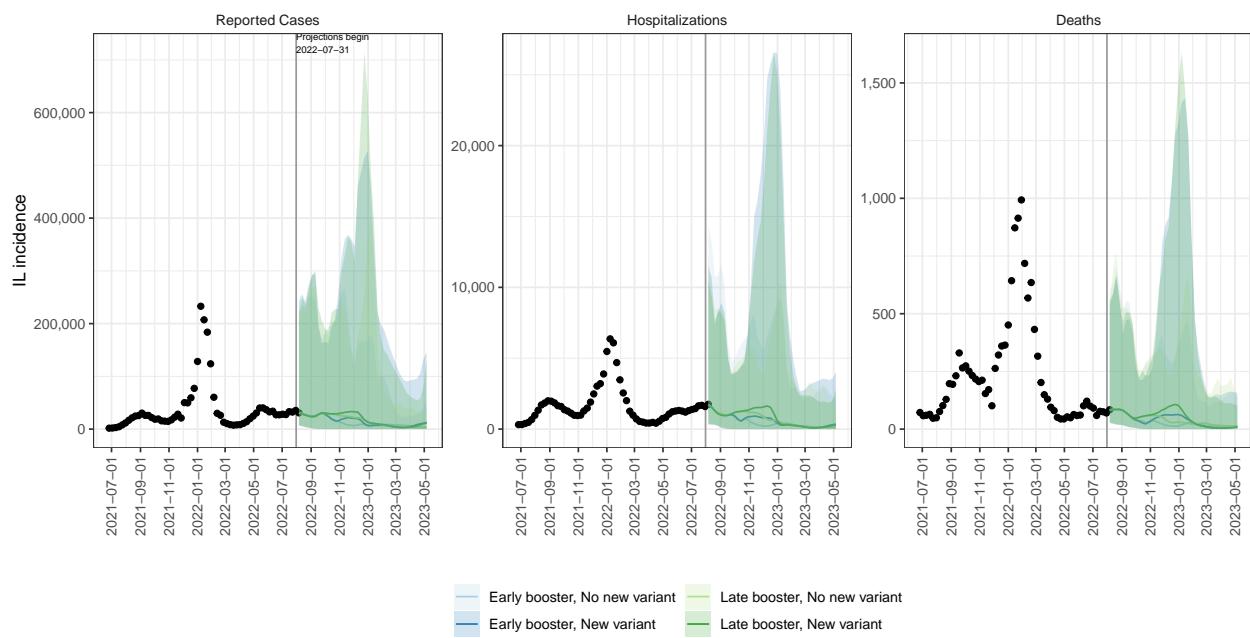
HI ensemble projections & 95% projection intervals



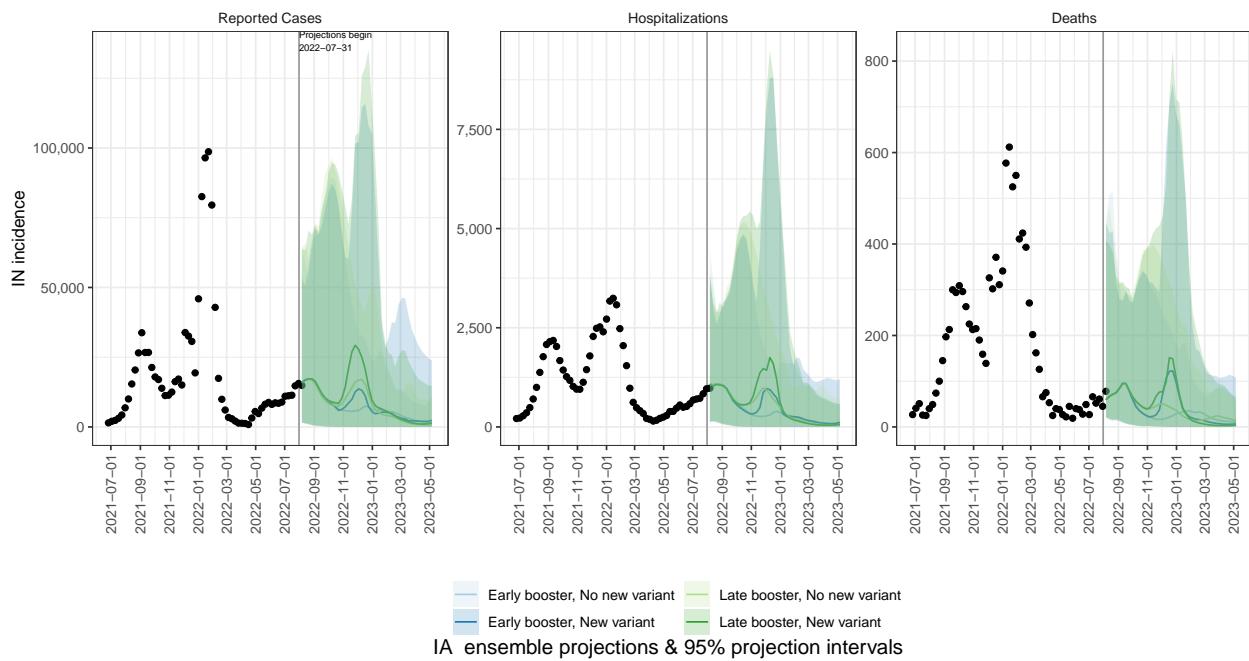
ID ensemble projections & 95% projection intervals



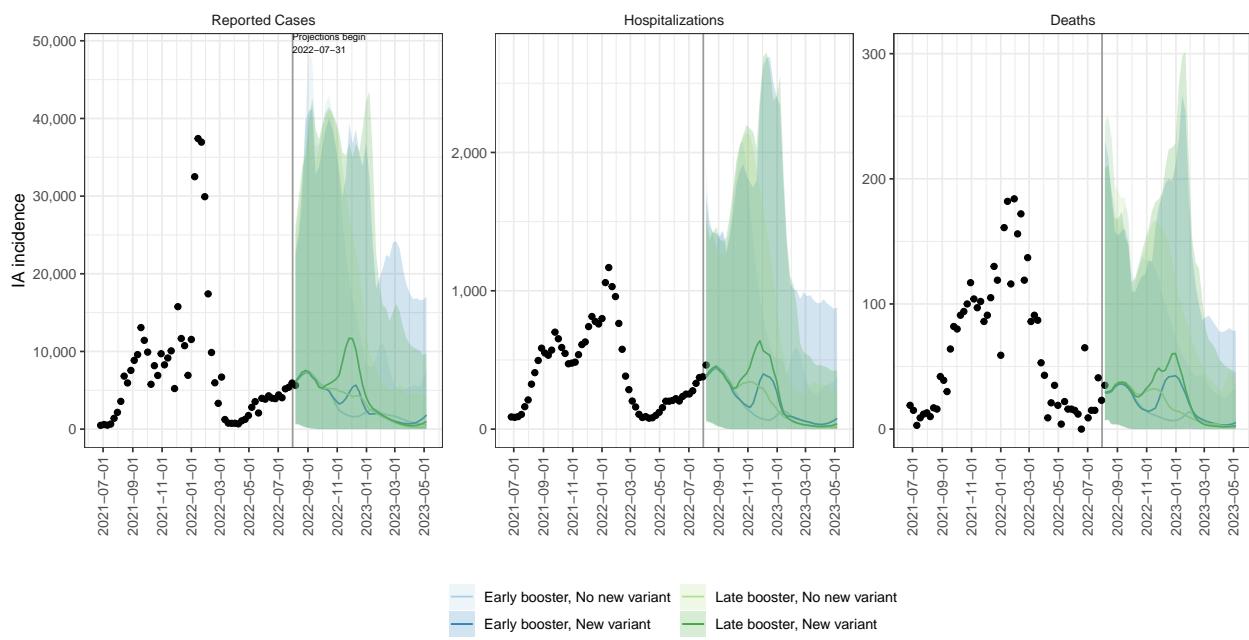
IL ensemble projections & 95% projection intervals



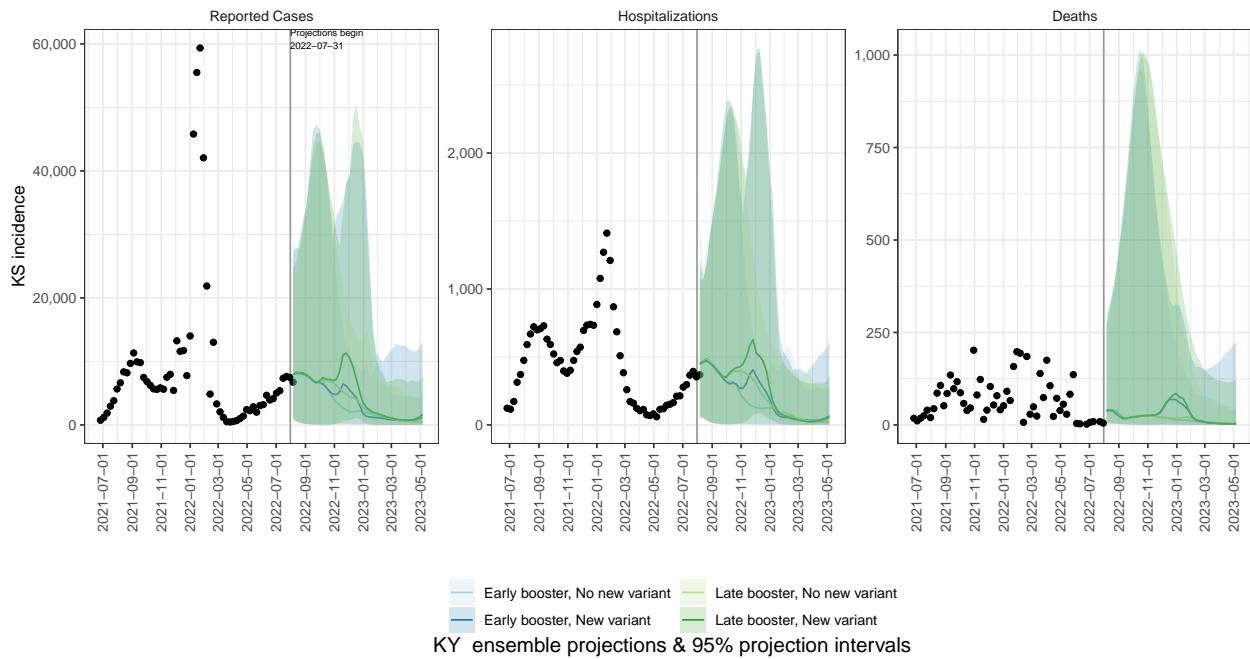
IN ensemble projections & 95% projection intervals



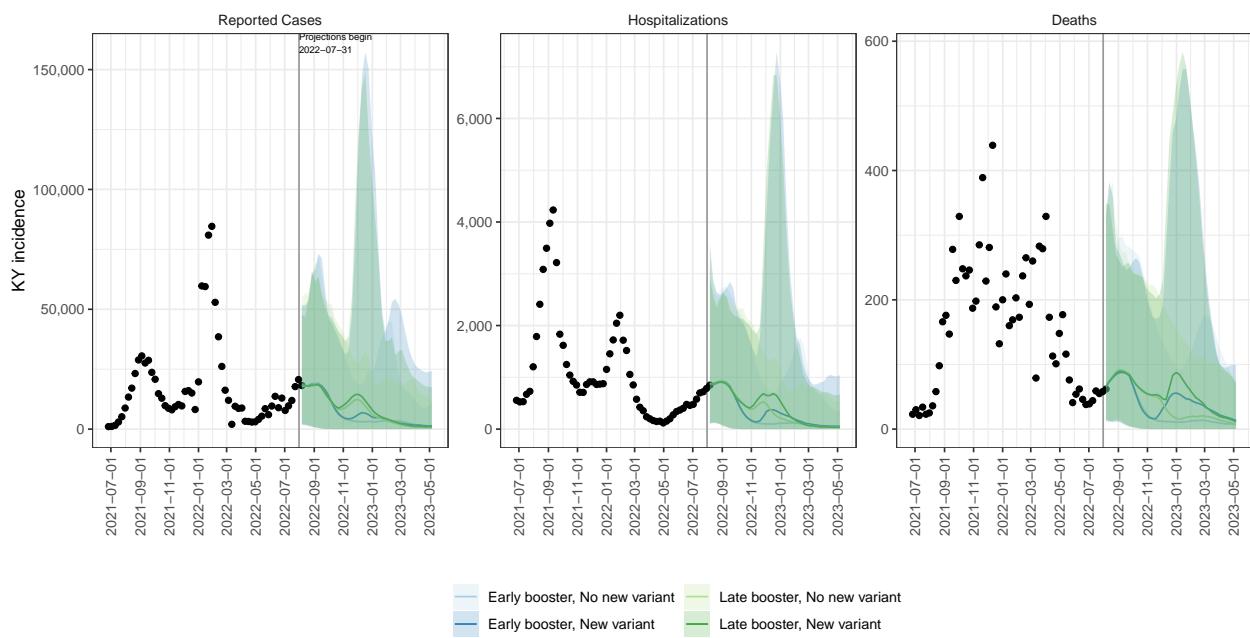
IA ensemble projections & 95% projection intervals



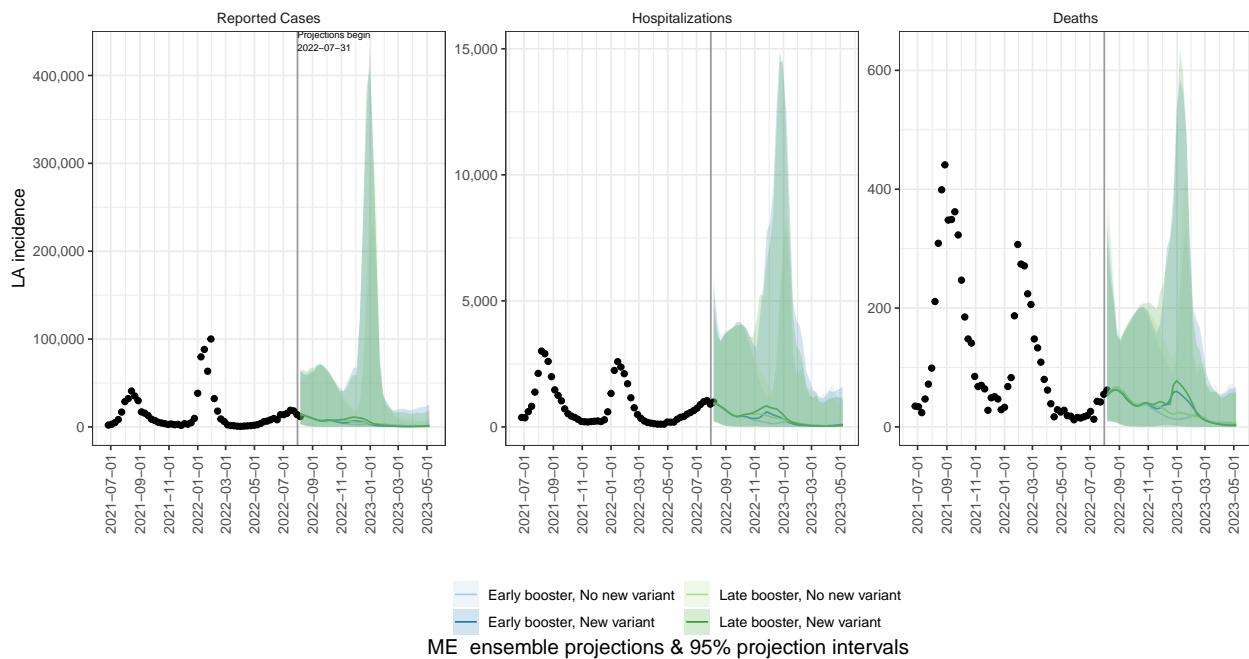
KS ensemble projections & 95% projection intervals



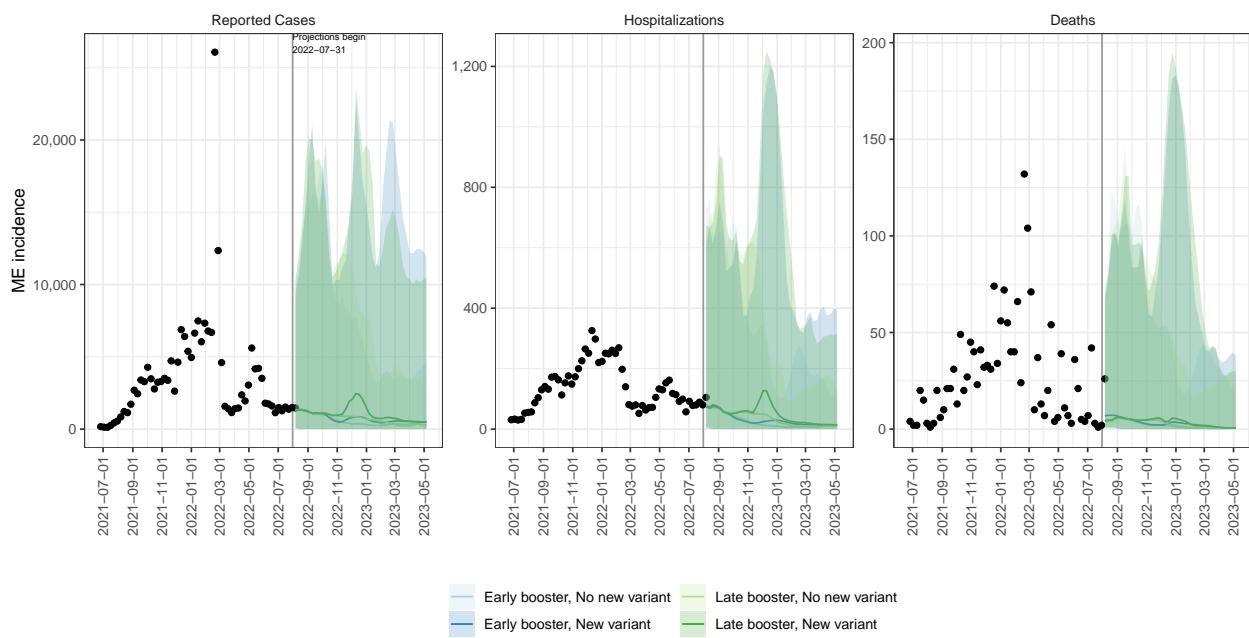
KY ensemble projections & 95% projection intervals



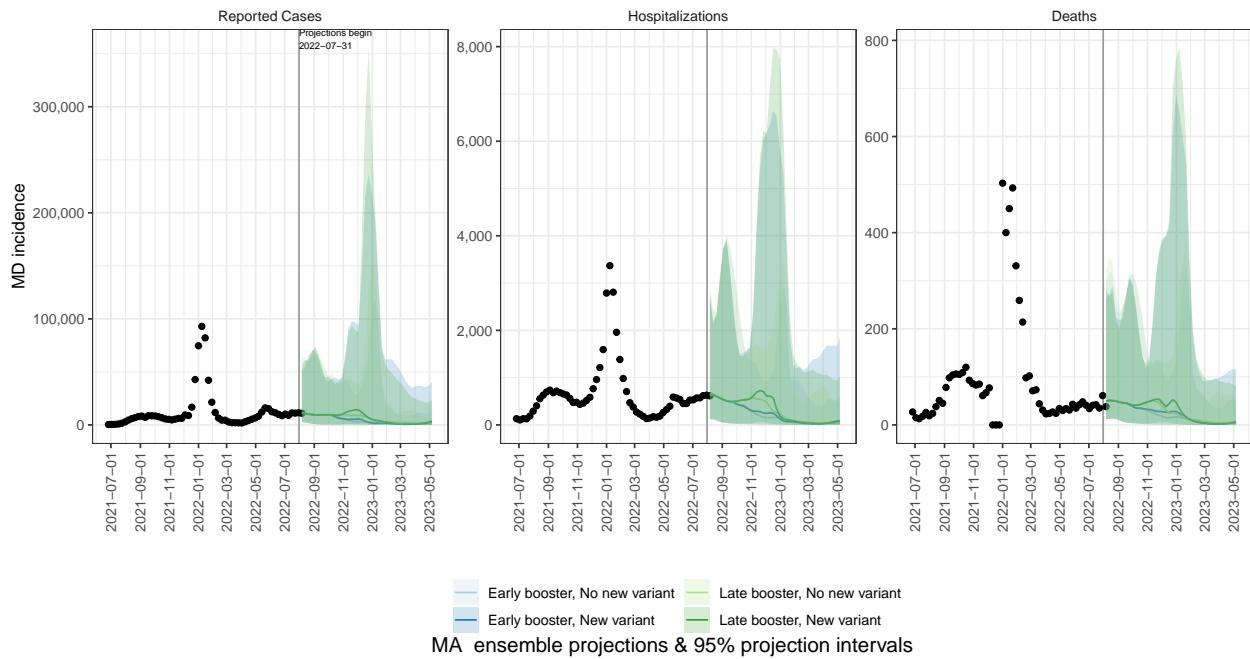
LA ensemble projections & 95% projection intervals



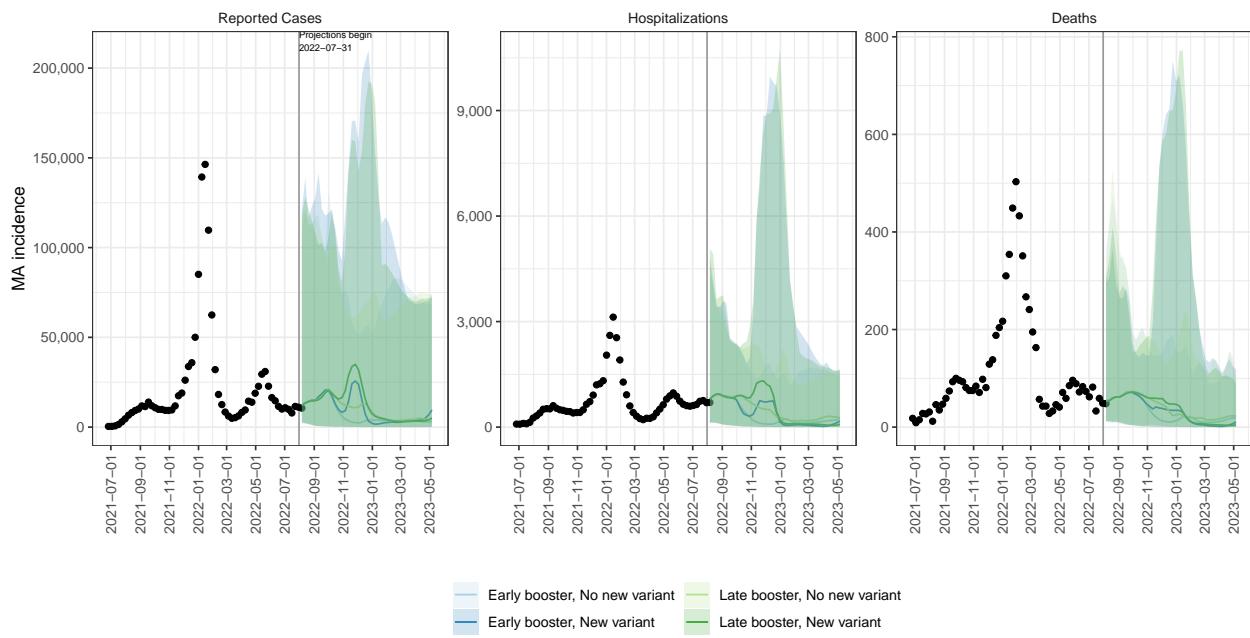
ME ensemble projections & 95% projection intervals



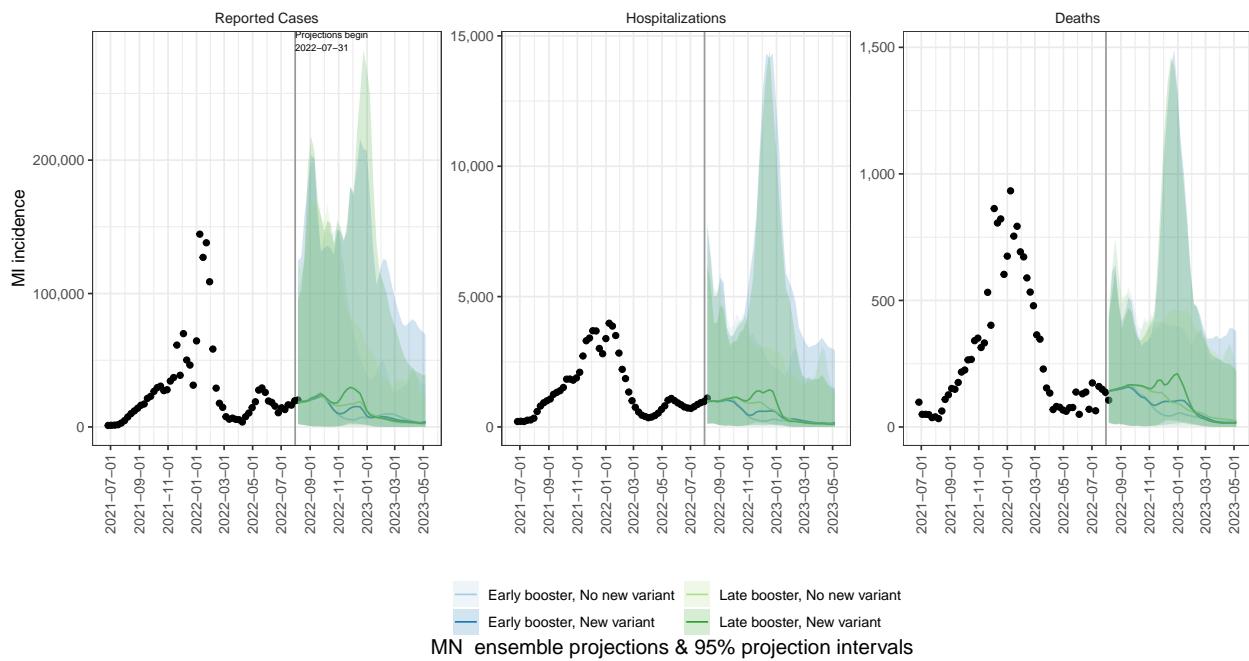
MD ensemble projections & 95% projection intervals



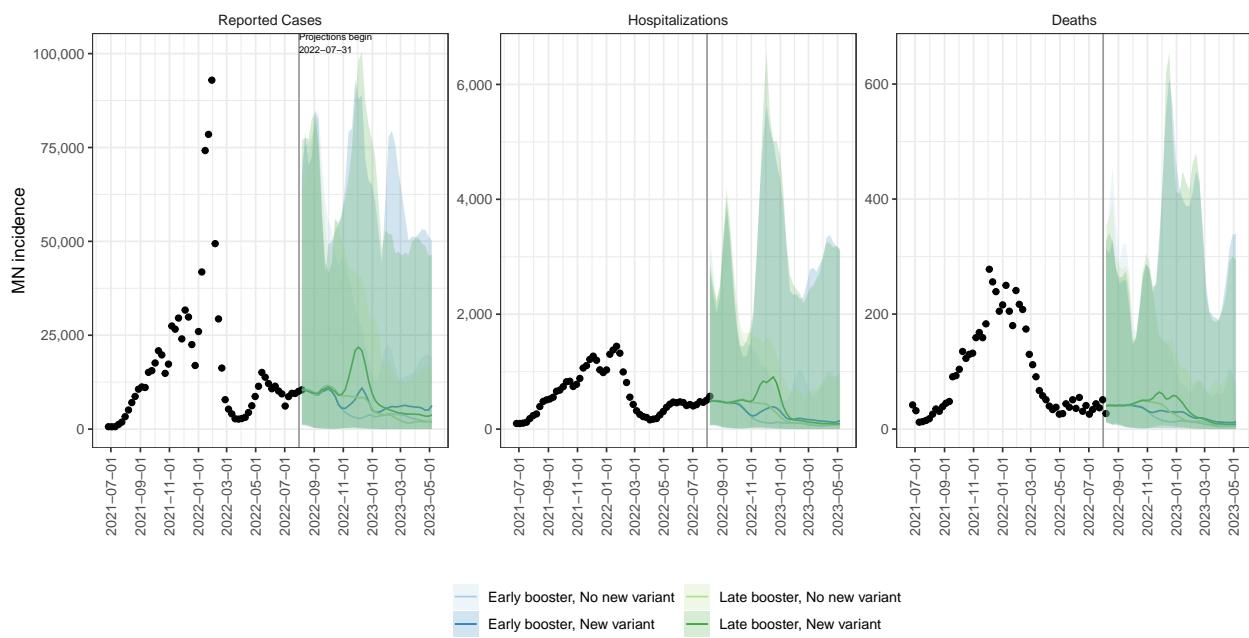
MA ensemble projections & 95% projection intervals



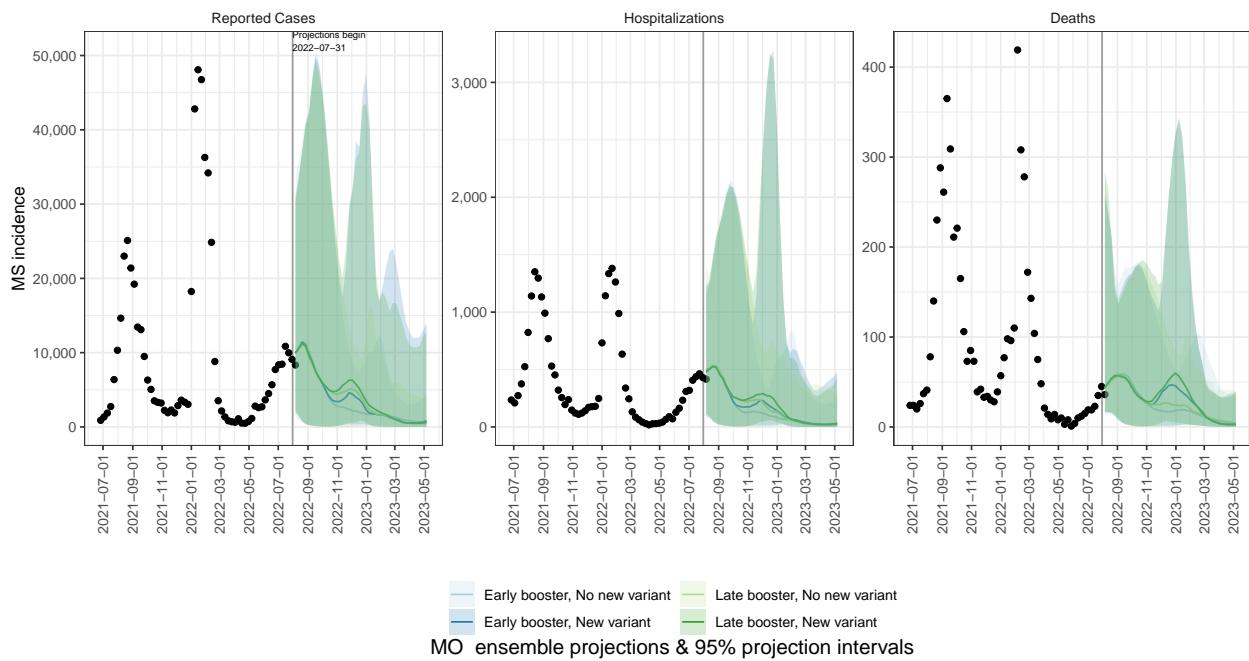
MI ensemble projections & 95% projection intervals



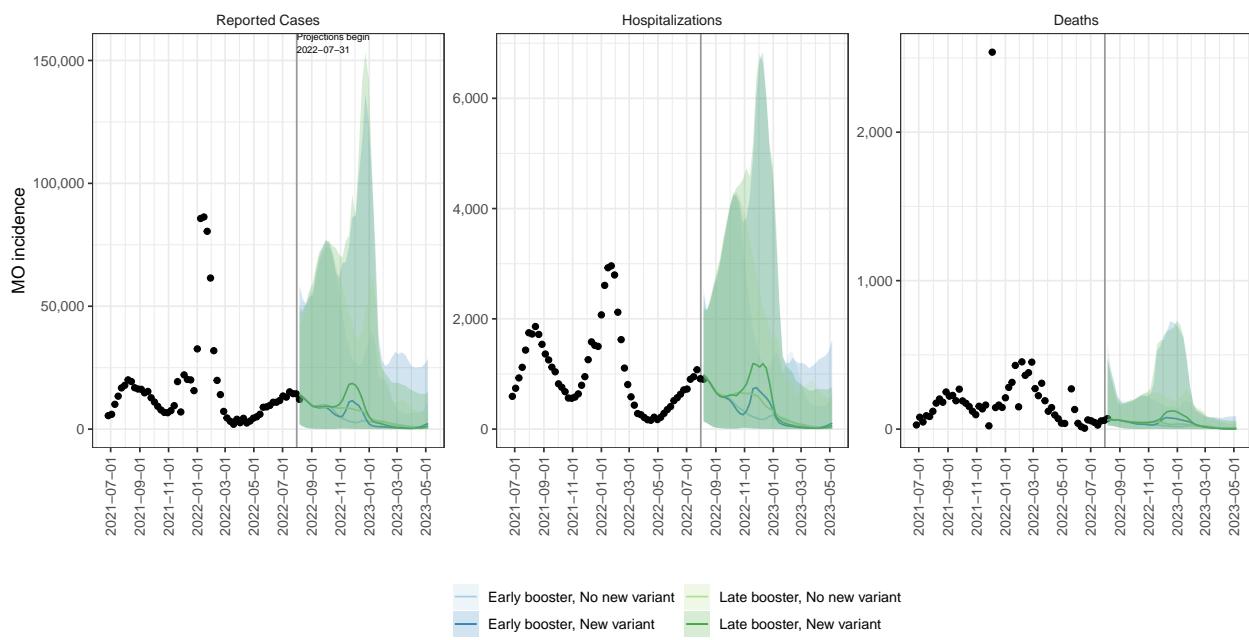
MN ensemble projections & 95% projection intervals



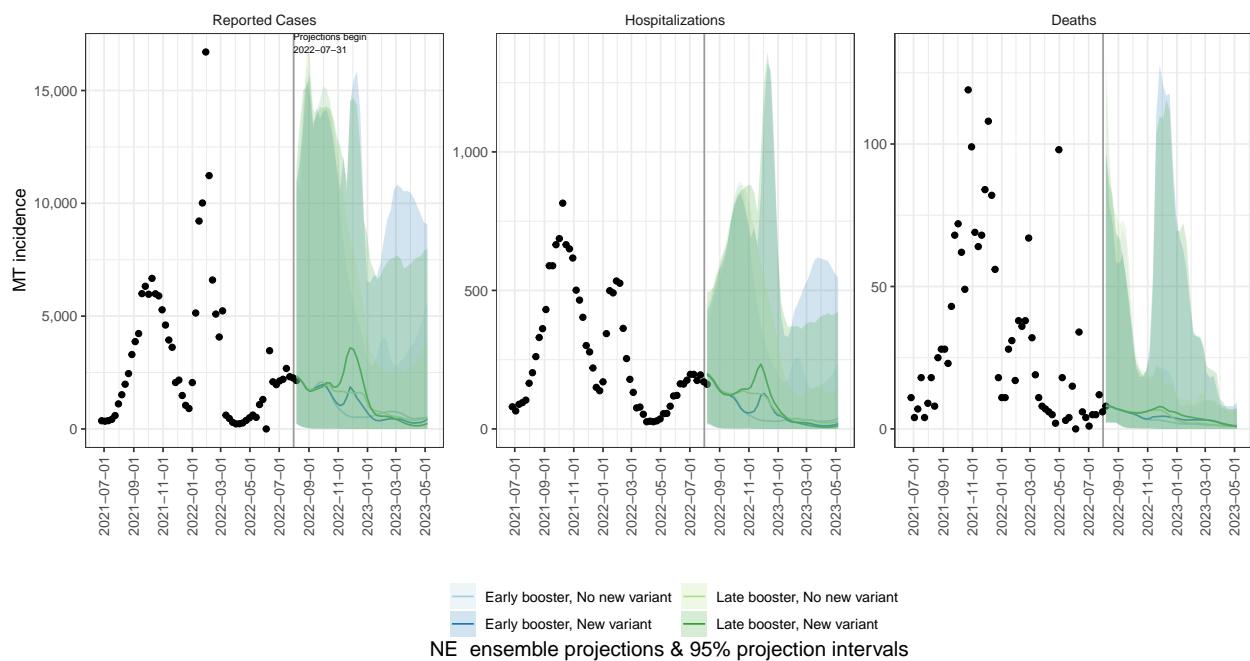
MS ensemble projections & 95% projection intervals



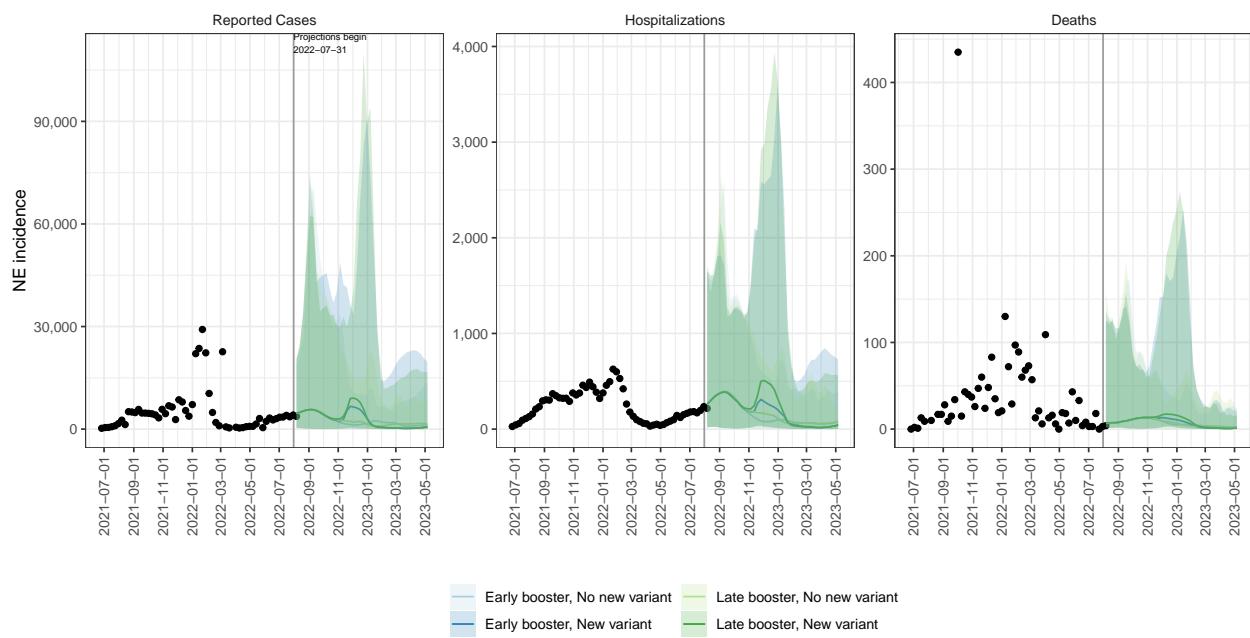
MO ensemble projections & 95% projection intervals



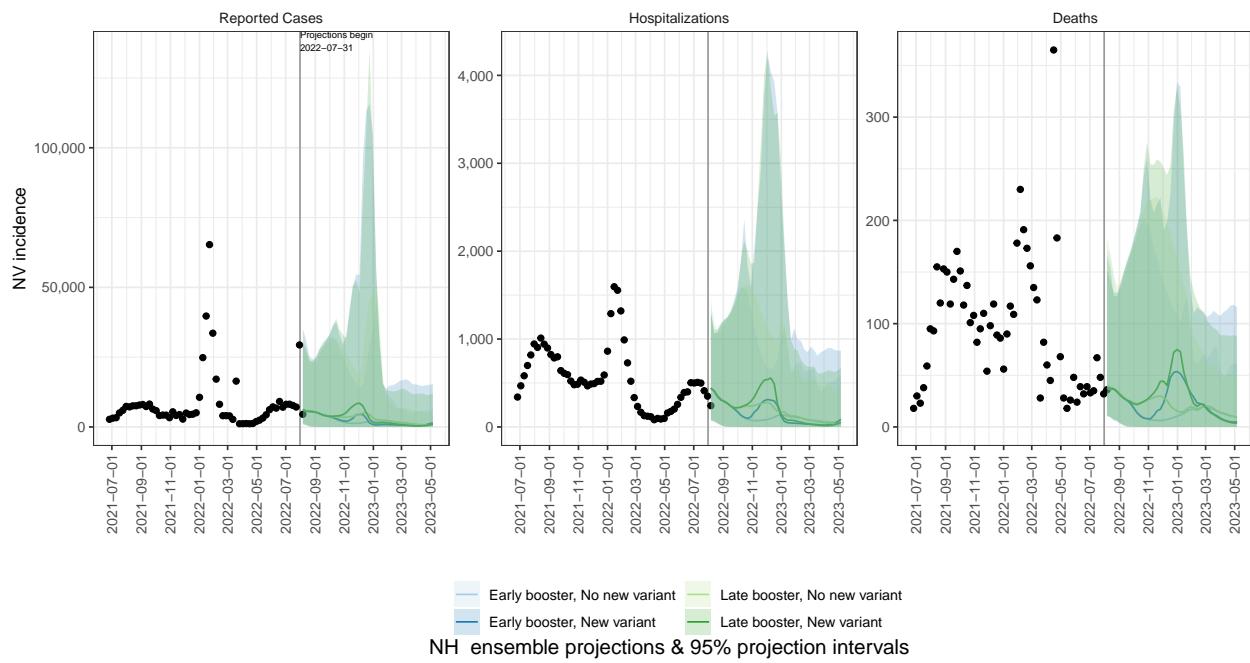
MT ensemble projections & 95% projection intervals



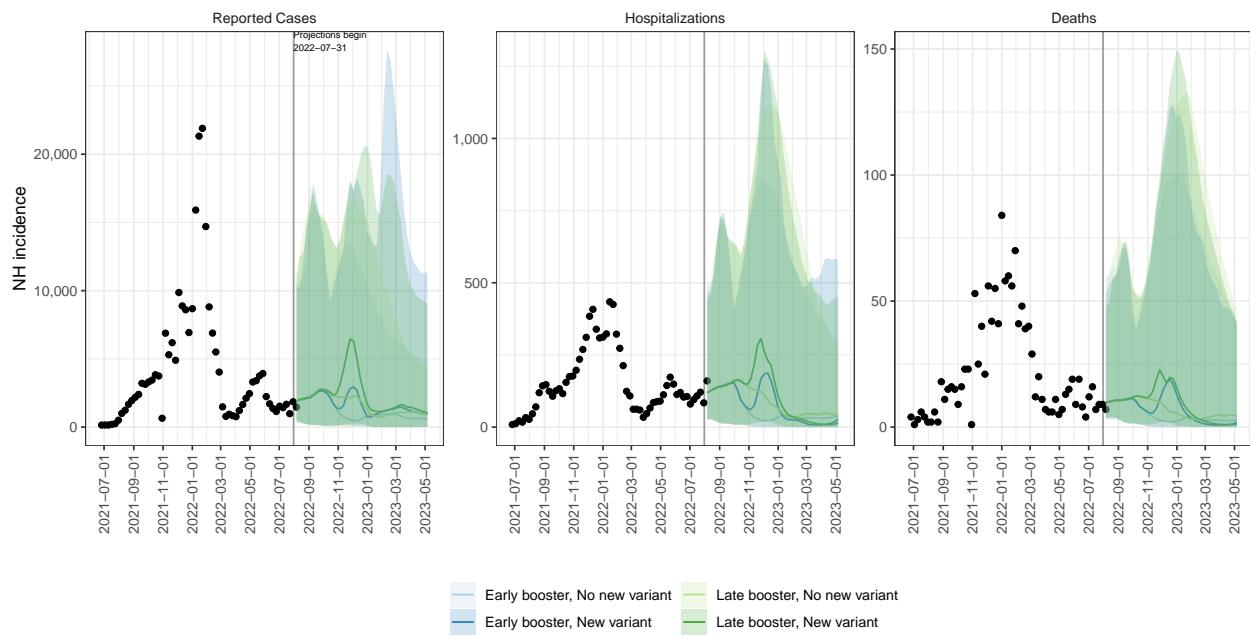
NE ensemble projections & 95% projection intervals



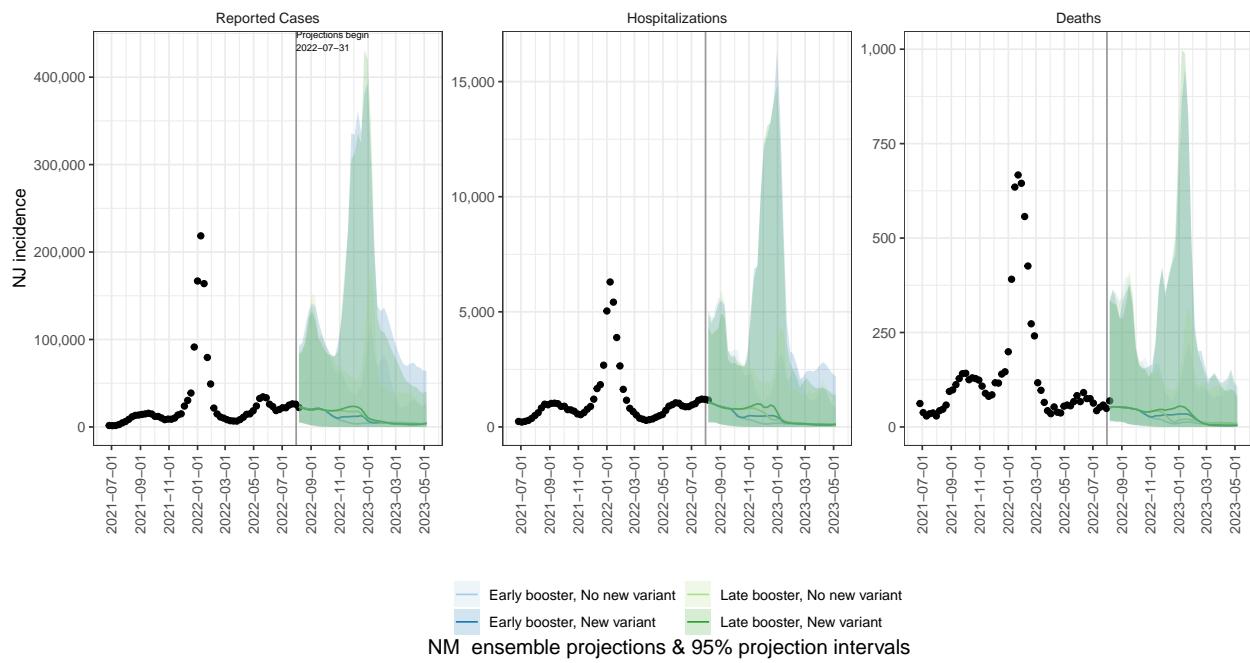
NV ensemble projections & 95% projection intervals



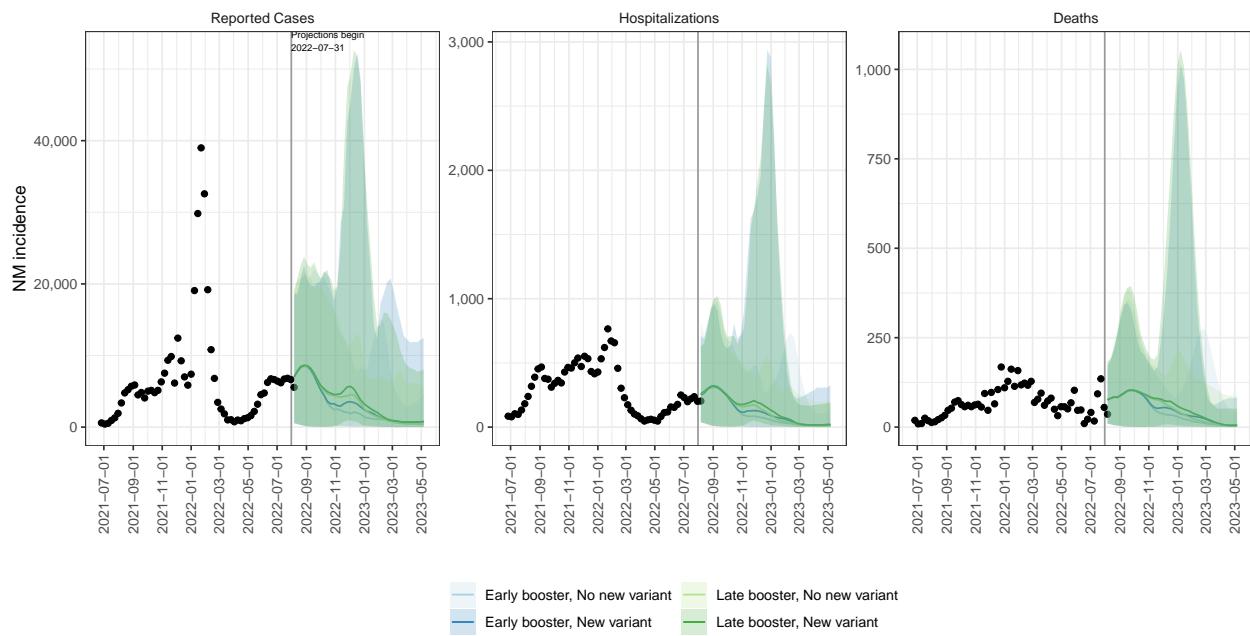
NH ensemble projections & 95% projection intervals



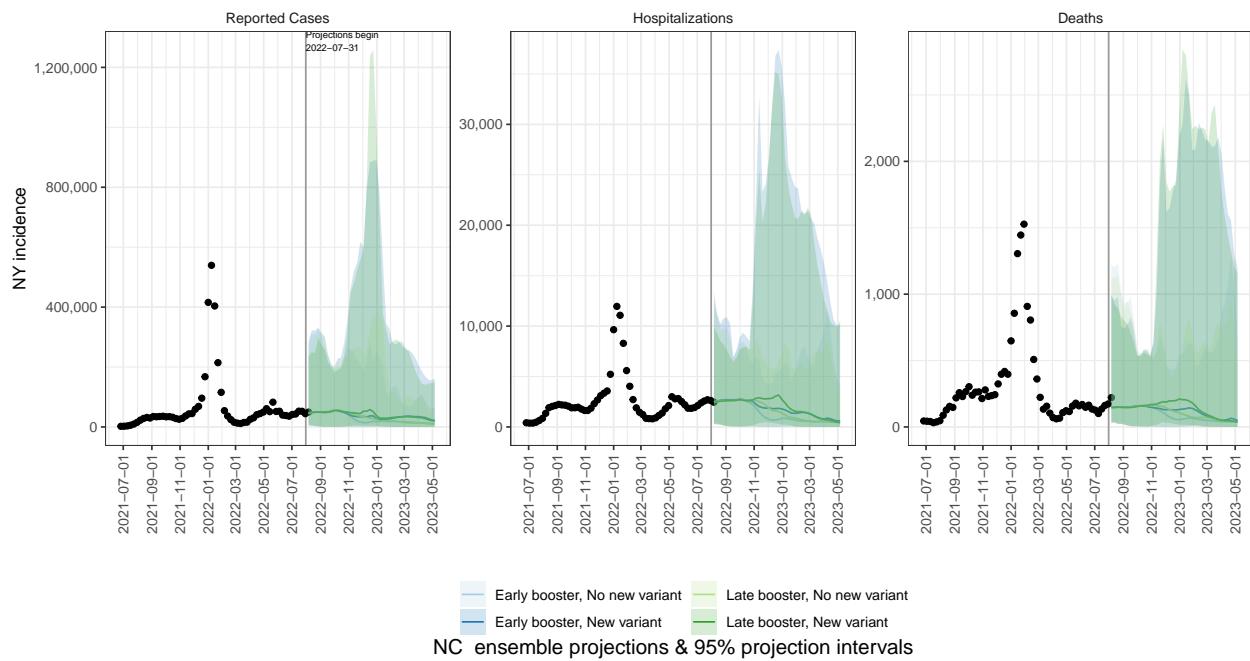
NJ ensemble projections & 95% projection intervals



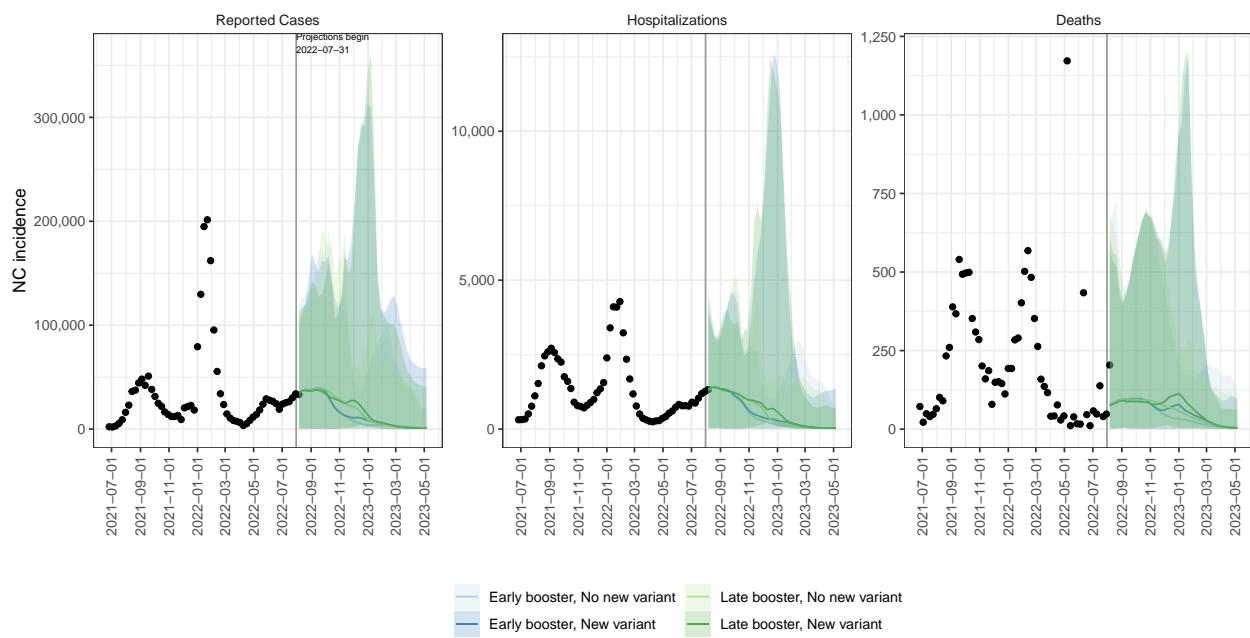
NM ensemble projections & 95% projection intervals



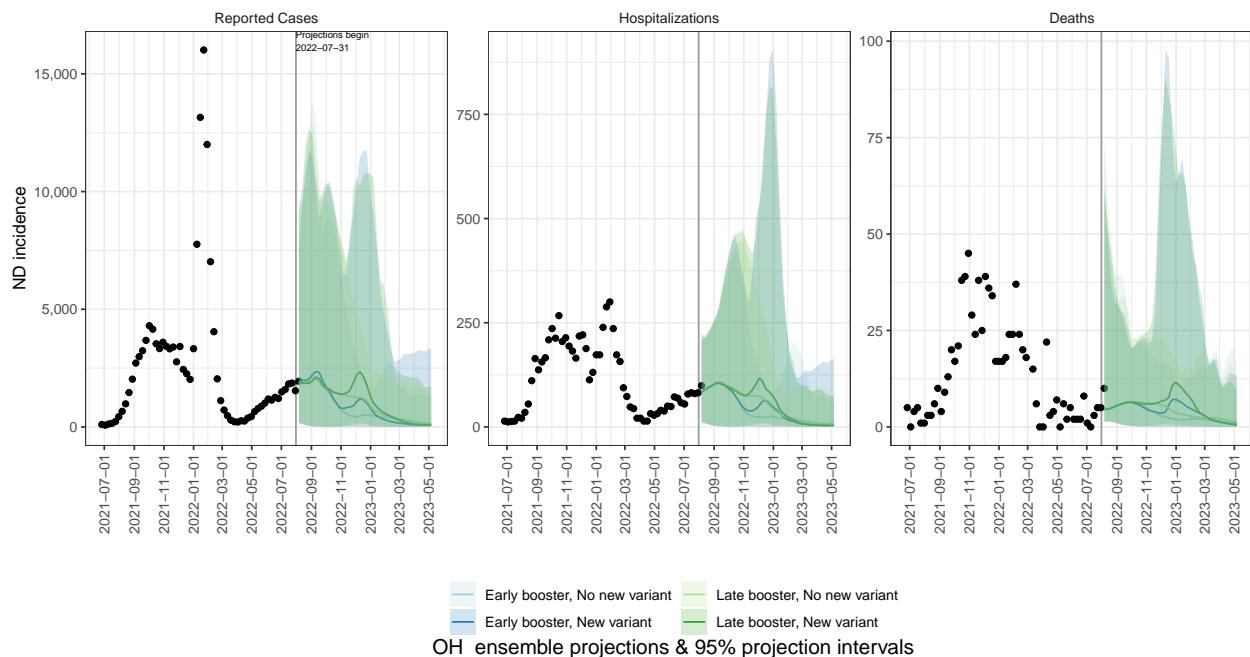
NY ensemble projections & 95% projection intervals



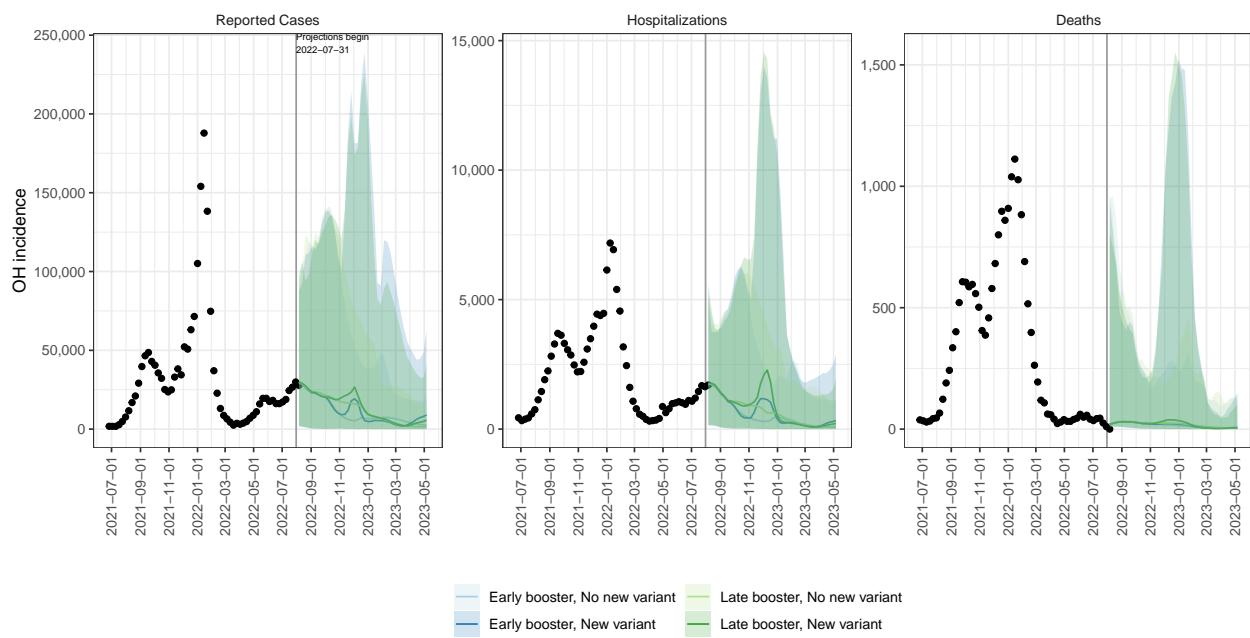
NC ensemble projections & 95% projection intervals



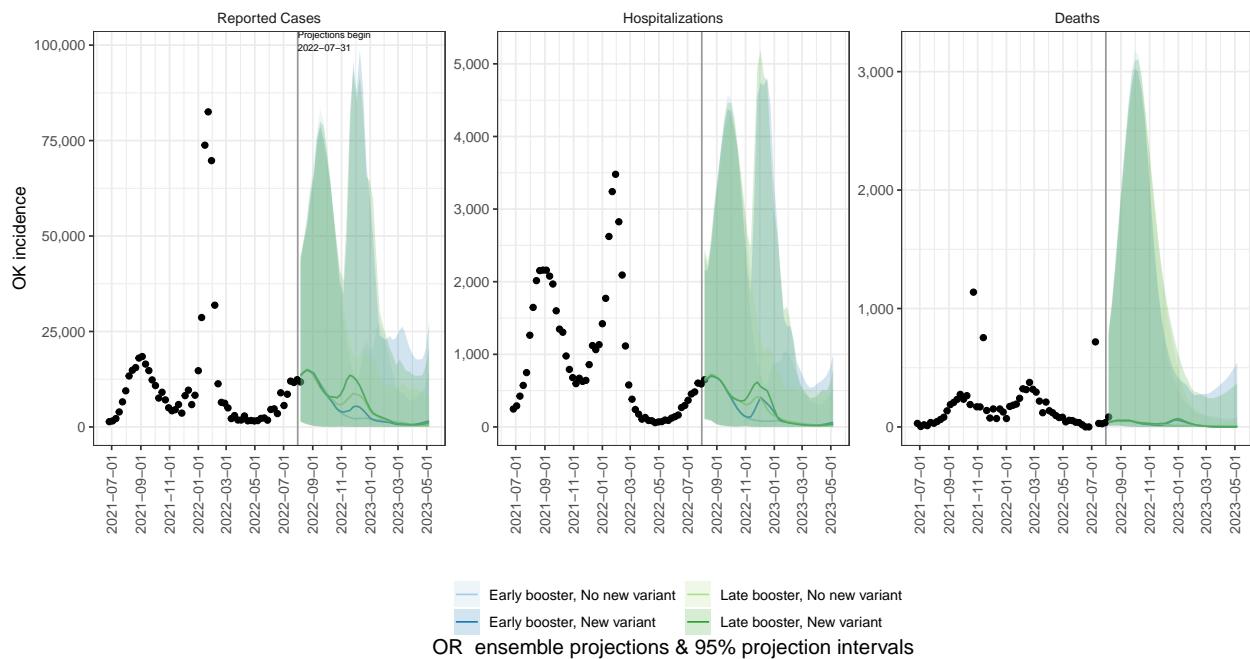
ND ensemble projections & 95% projection intervals



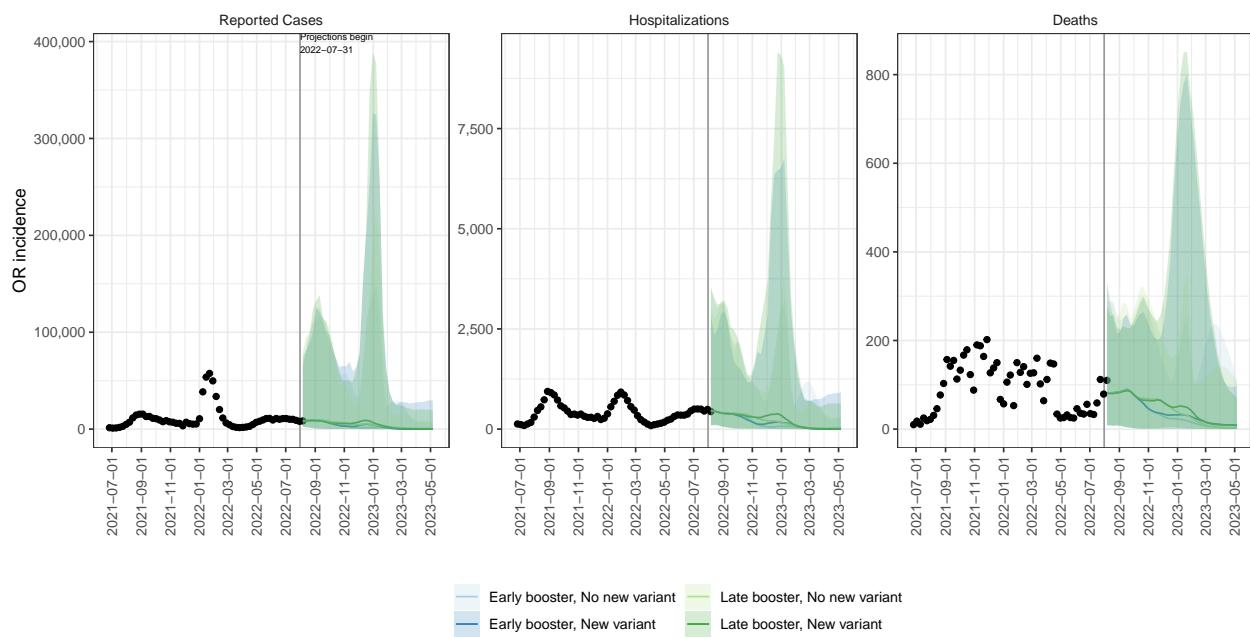
OH ensemble projections & 95% projection intervals



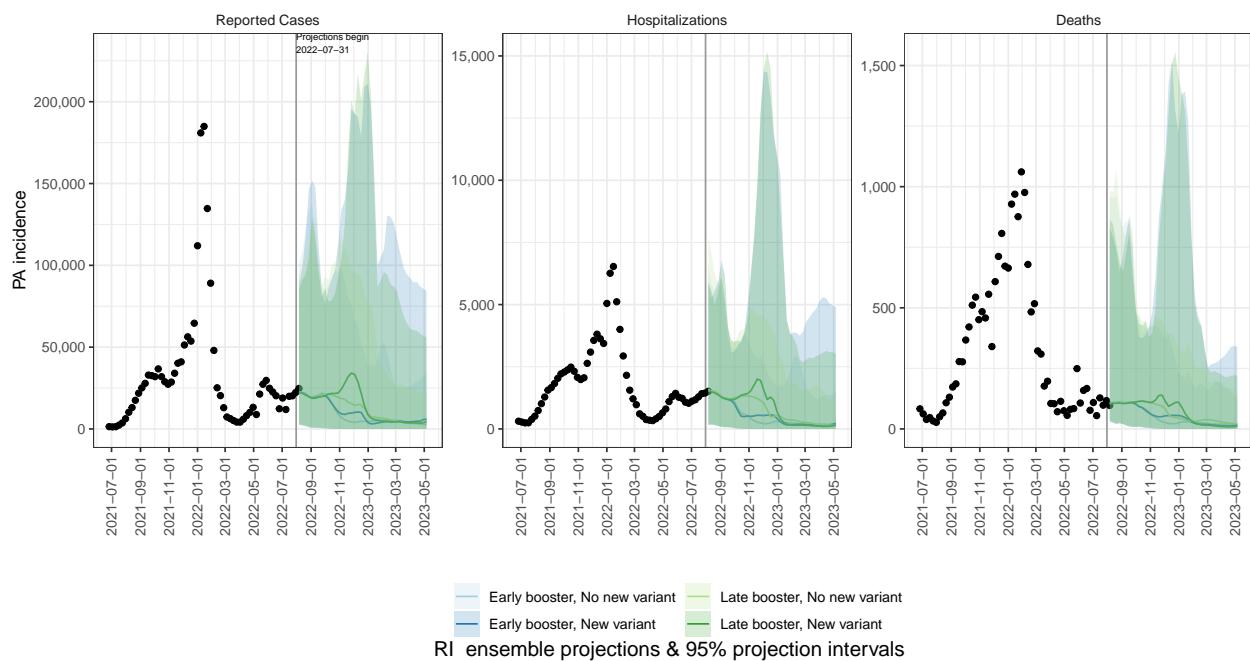
OK ensemble projections & 95% projection intervals



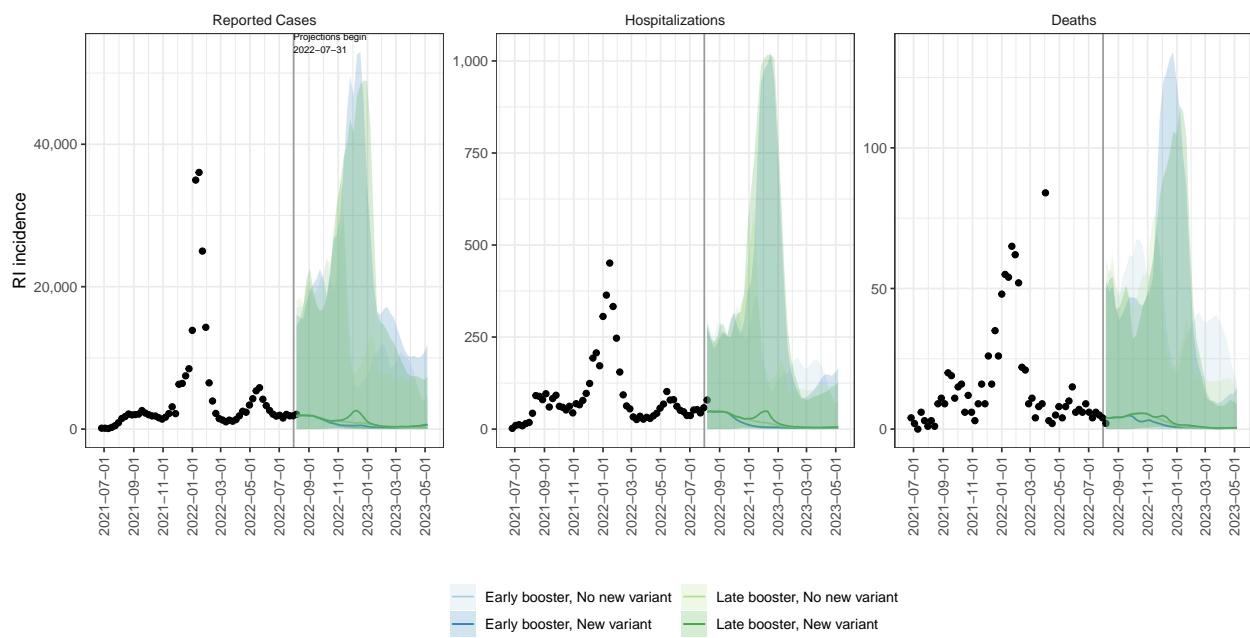
OR ensemble projections & 95% projection intervals



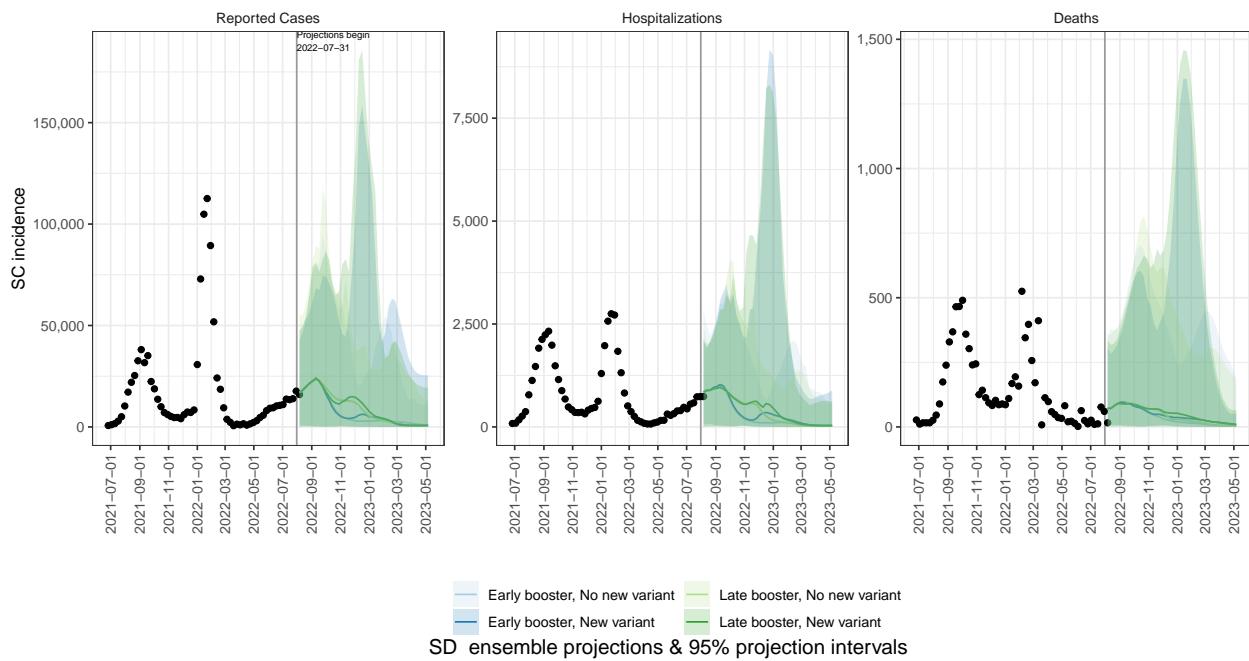
PA ensemble projections & 95% projection intervals



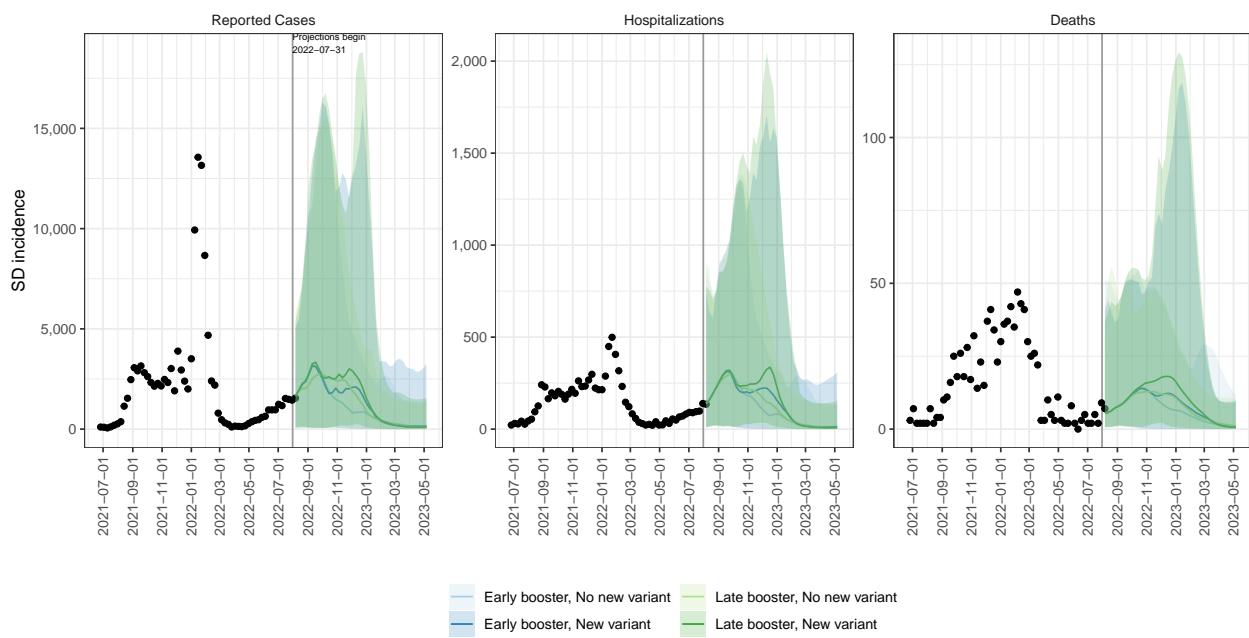
RI ensemble projections & 95% projection intervals



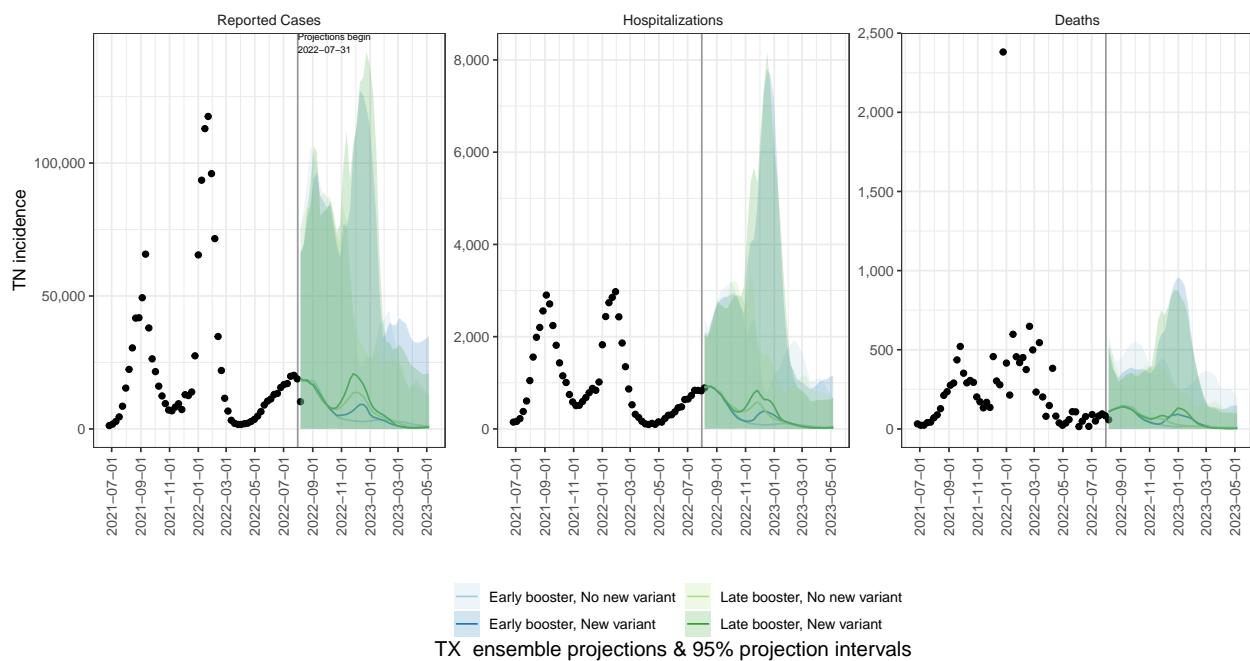
SC ensemble projections & 95% projection intervals



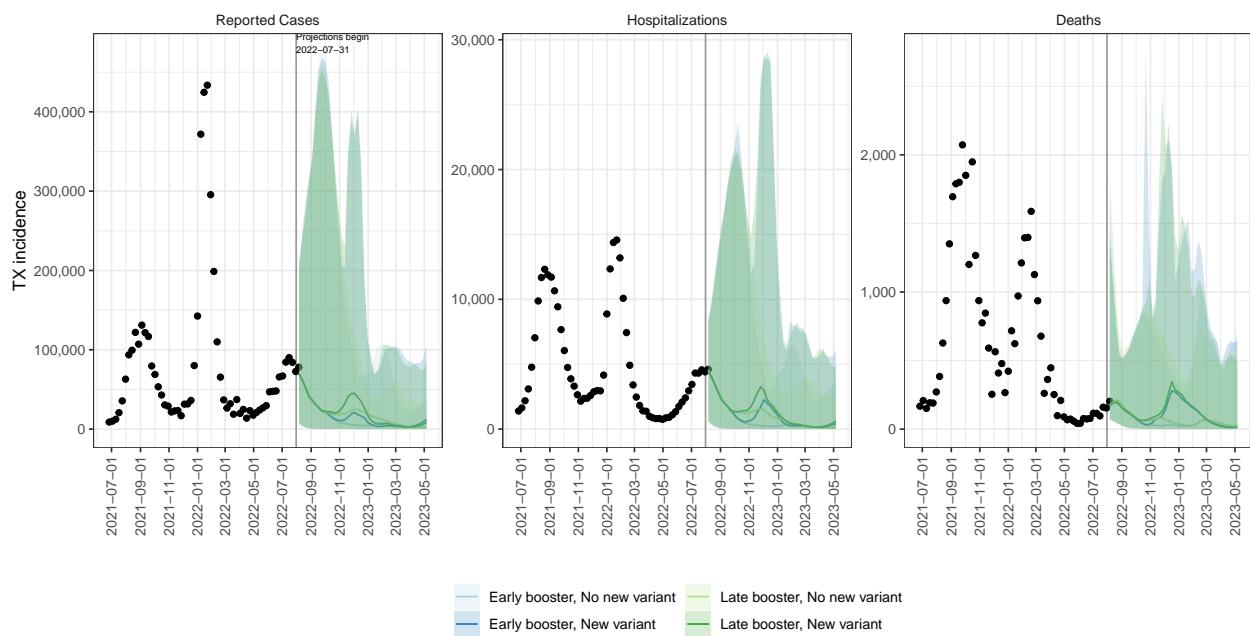
SD ensemble projections & 95% projection intervals



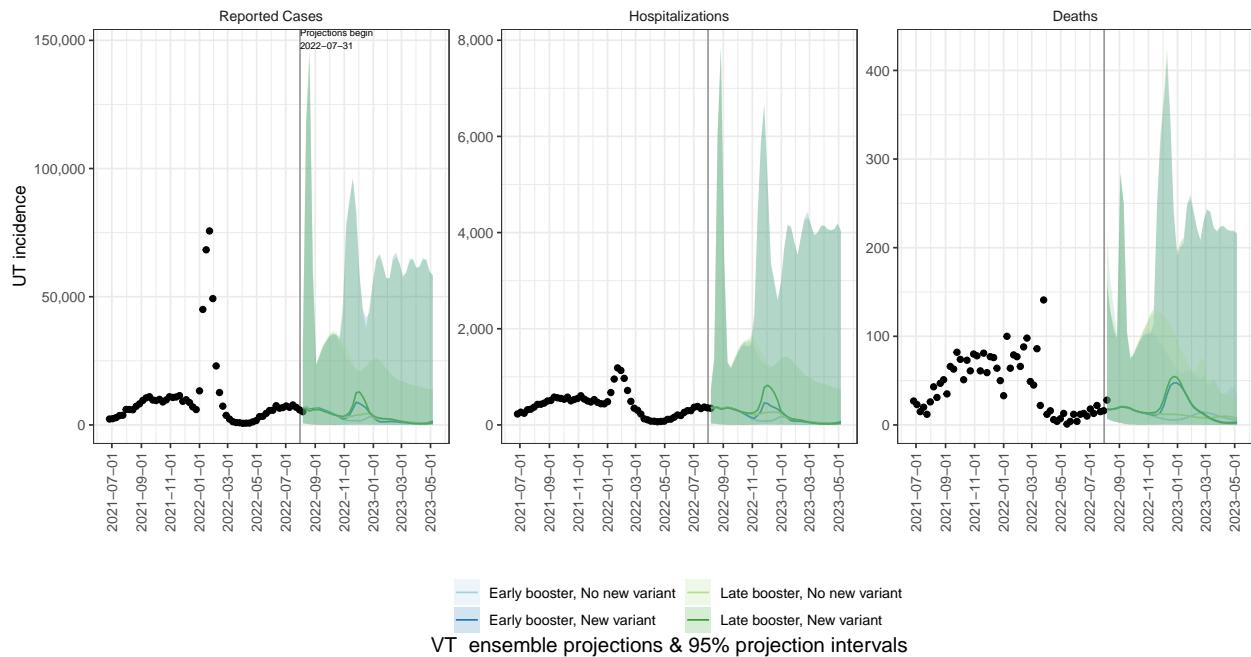
TN ensemble projections & 95% projection intervals



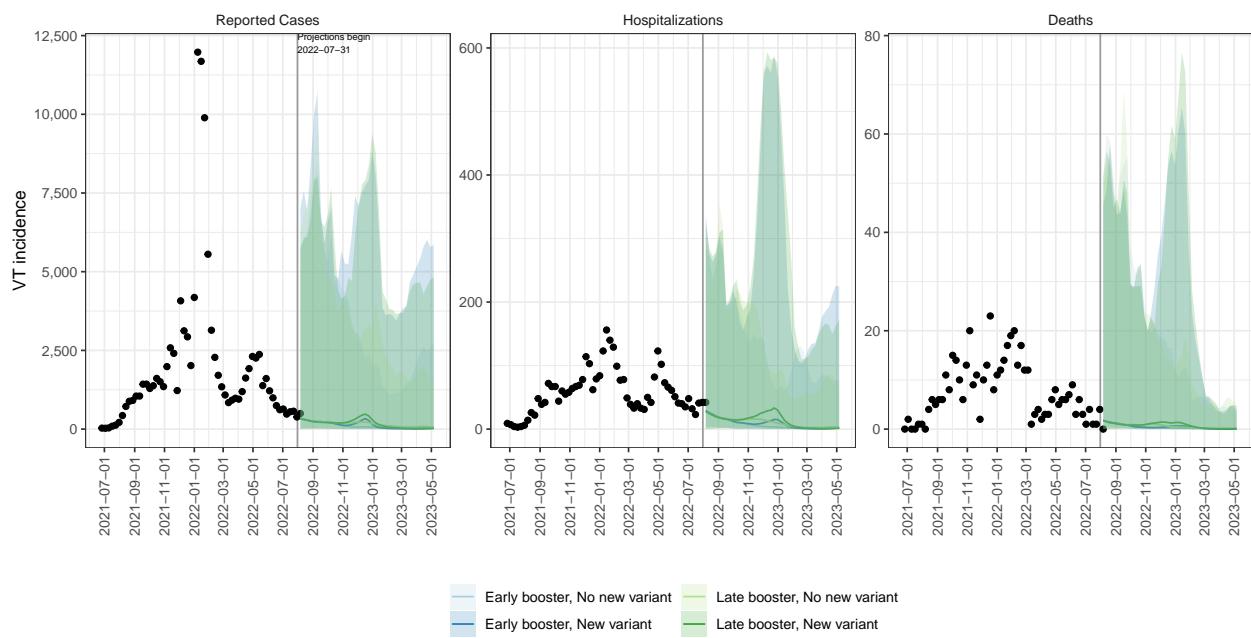
TX ensemble projections & 95% projection intervals



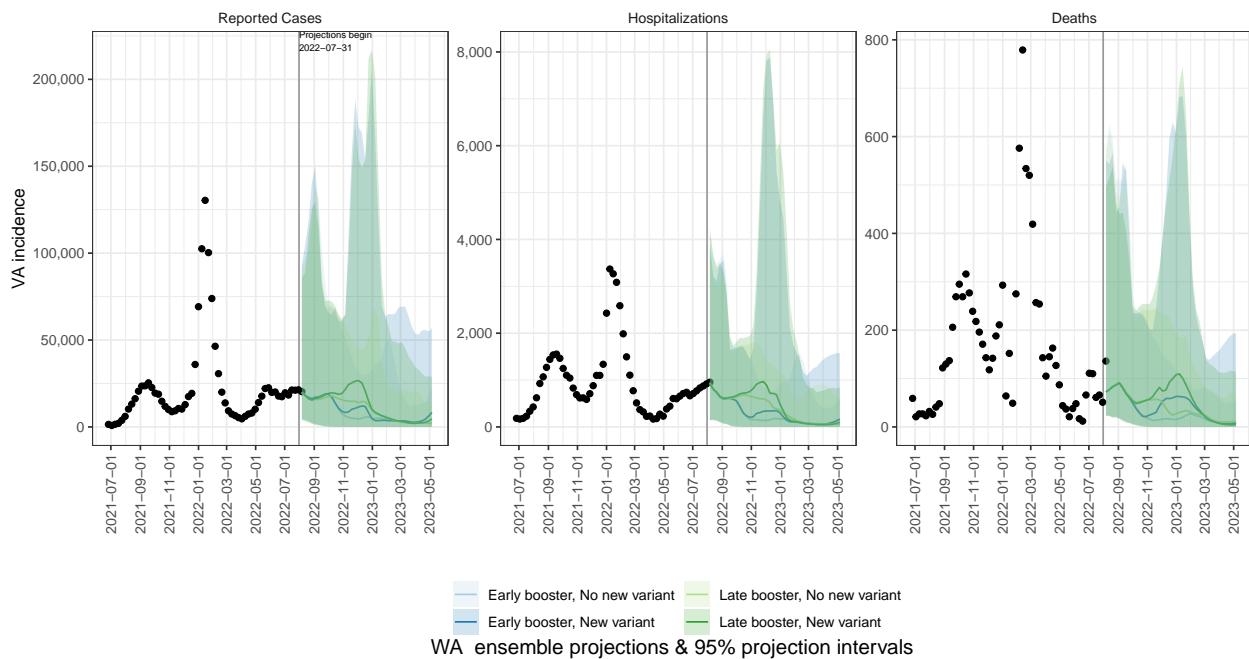
UT ensemble projections & 95% projection intervals



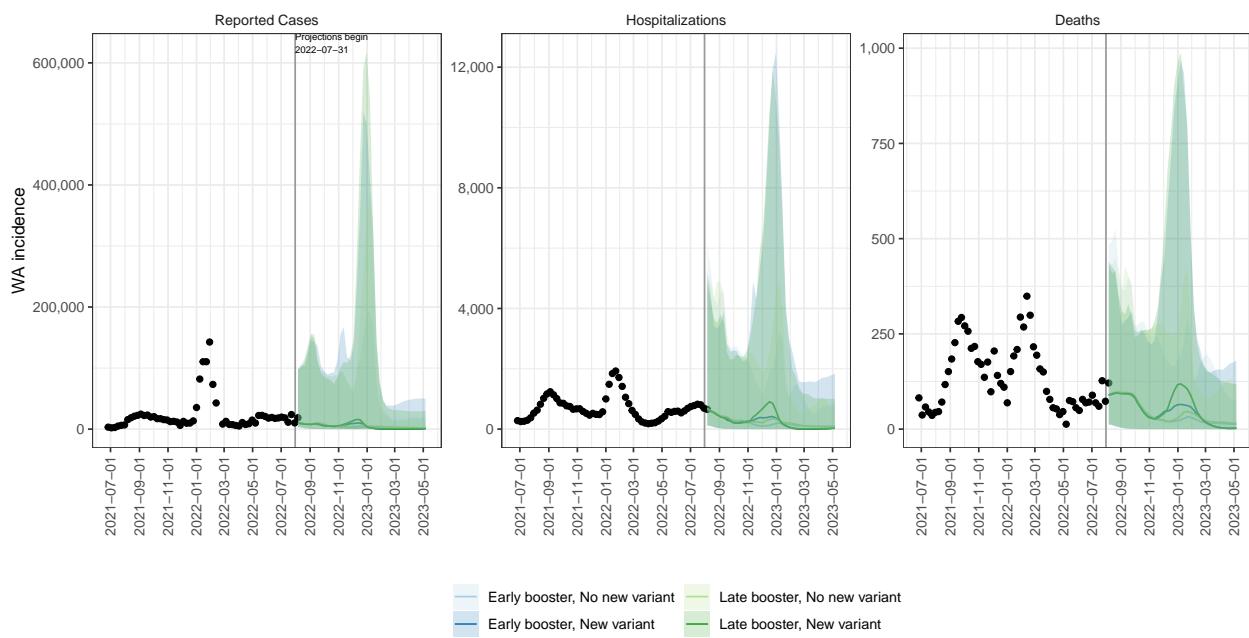
VT ensemble projections & 95% projection intervals



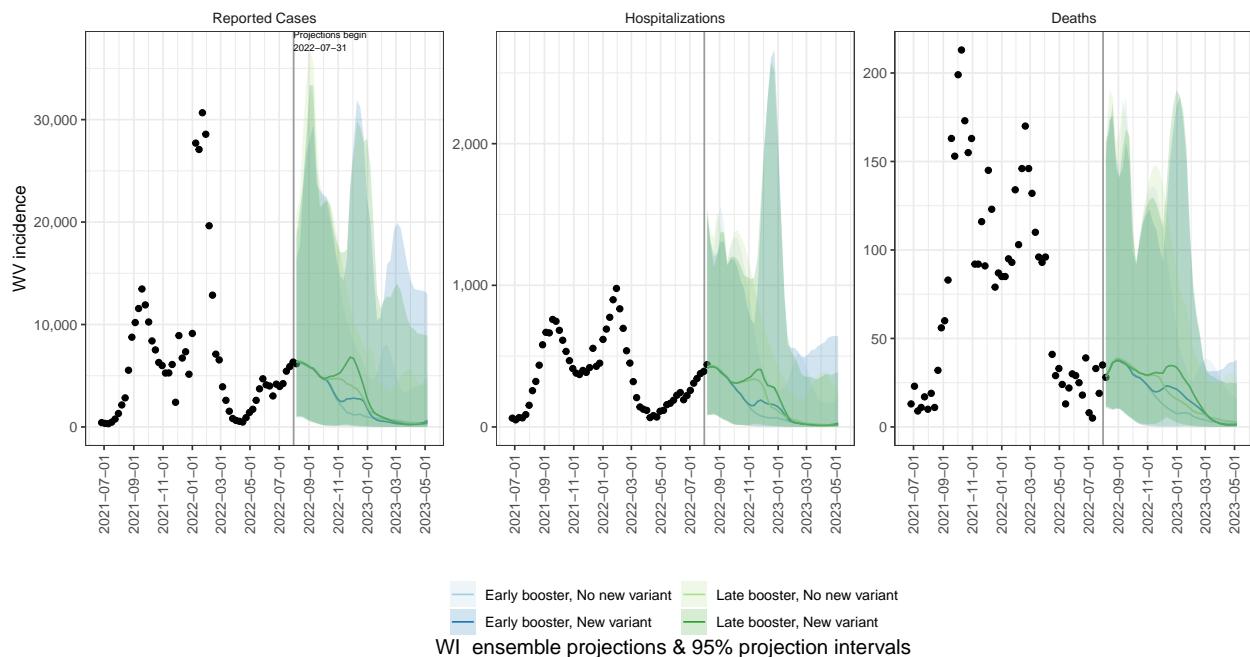
VA ensemble projections & 95% projection intervals



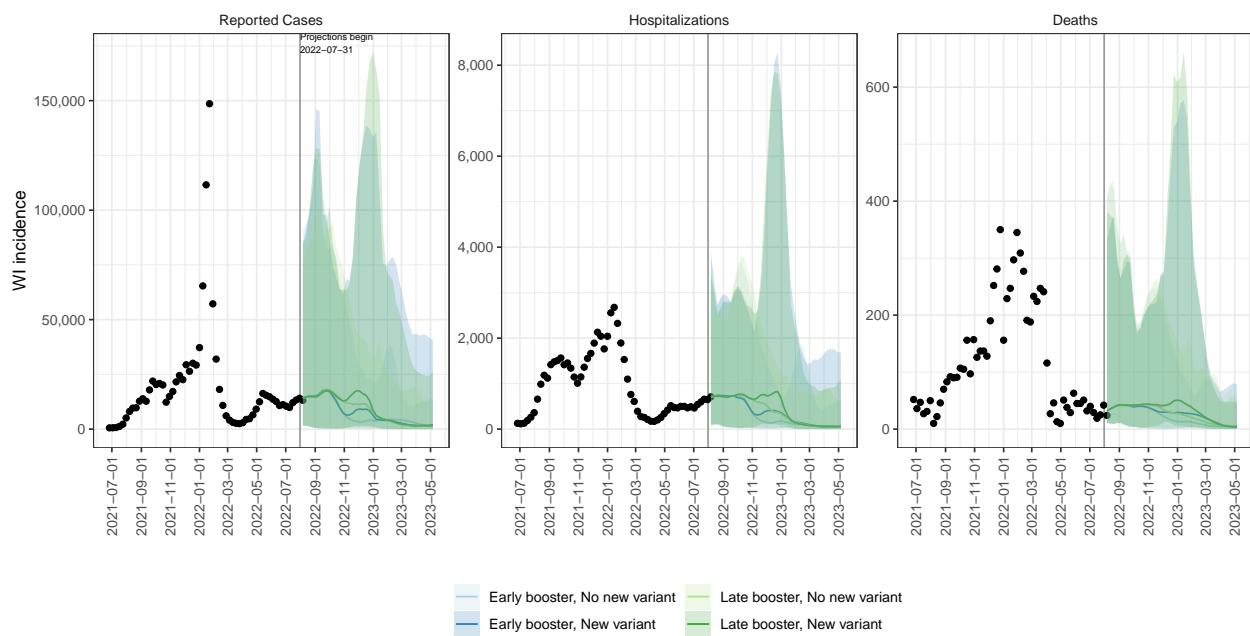
WA ensemble projections & 95% projection intervals



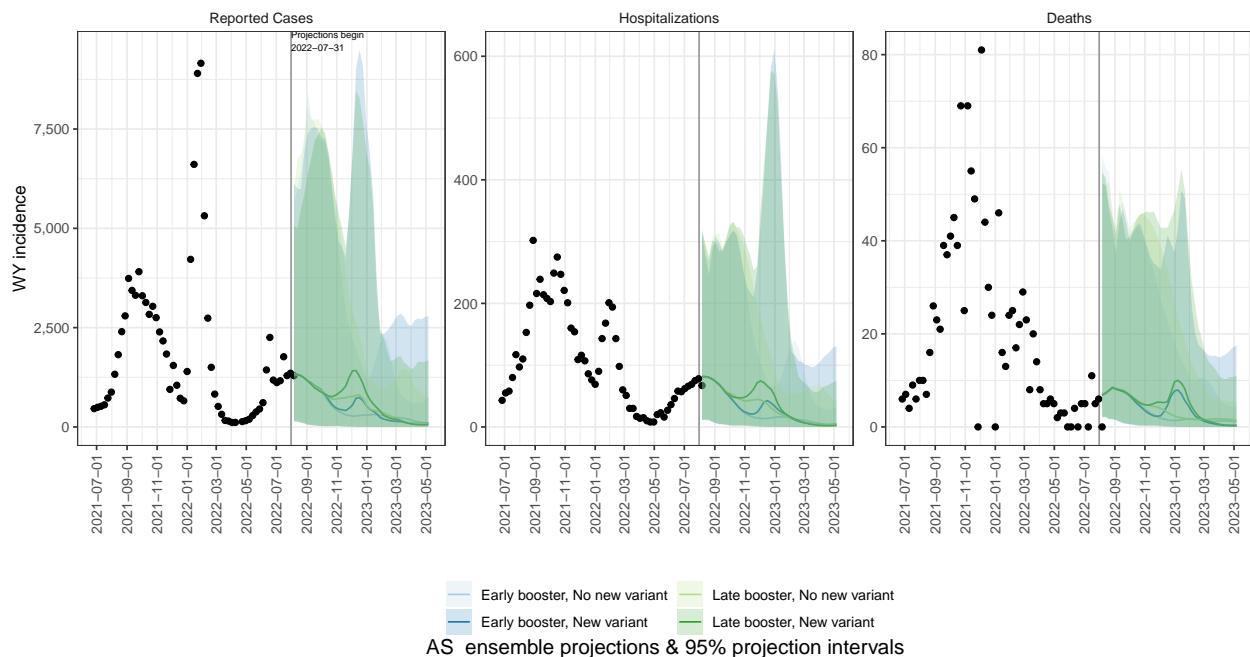
WV ensemble projections & 95% projection intervals



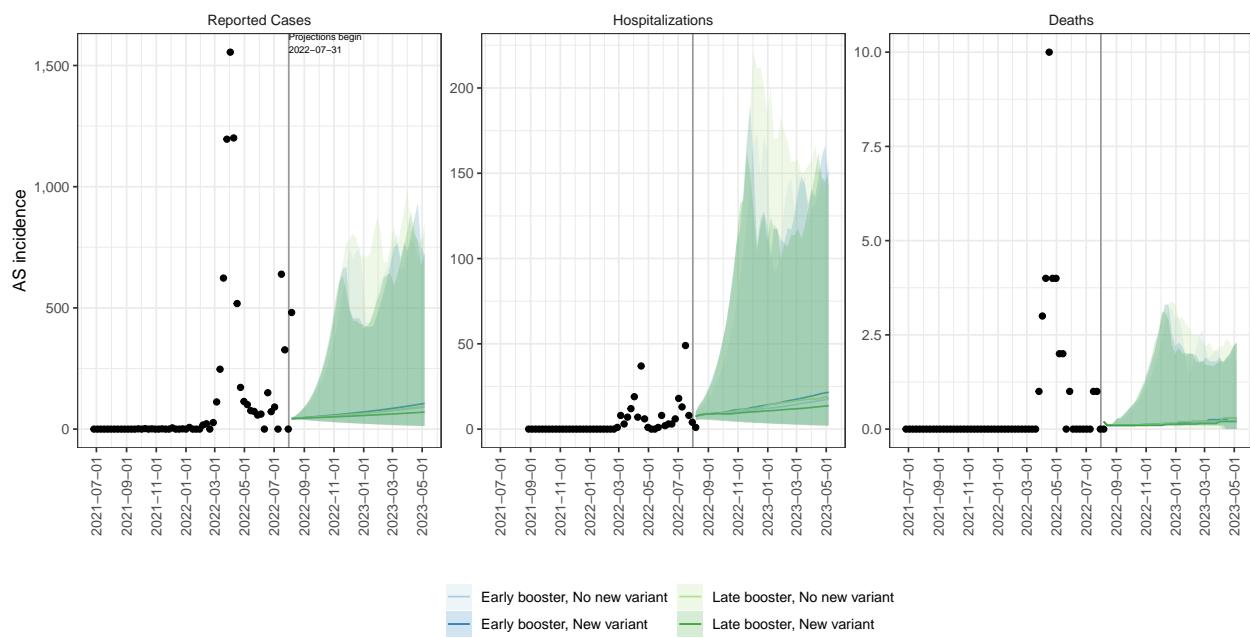
WI ensemble projections & 95% projection intervals



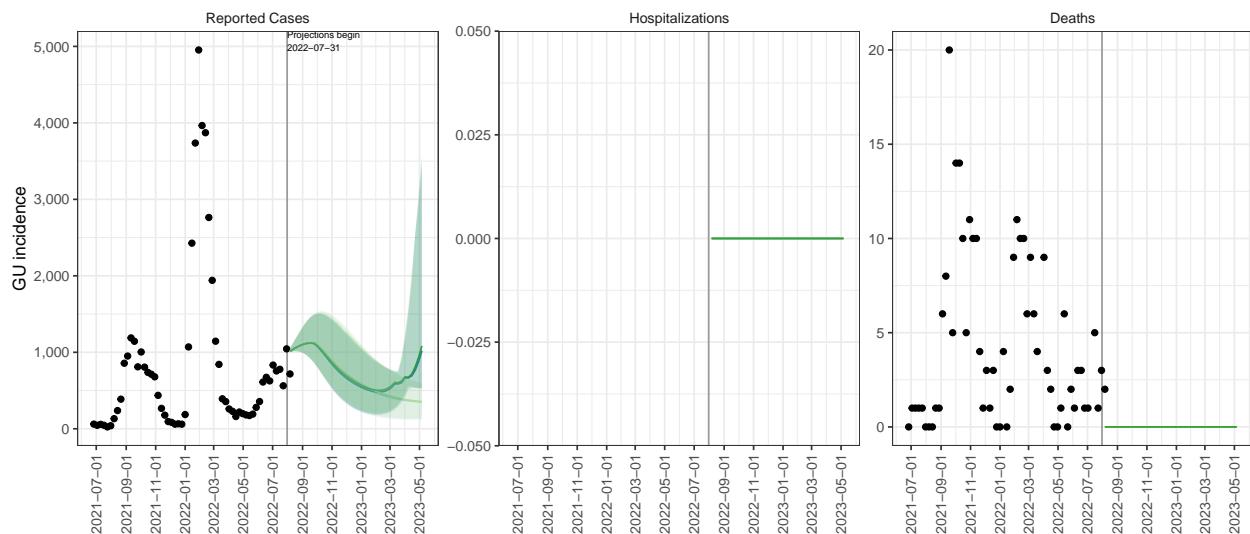
WY ensemble projections & 95% projection intervals



AS ensemble projections & 95% projection intervals

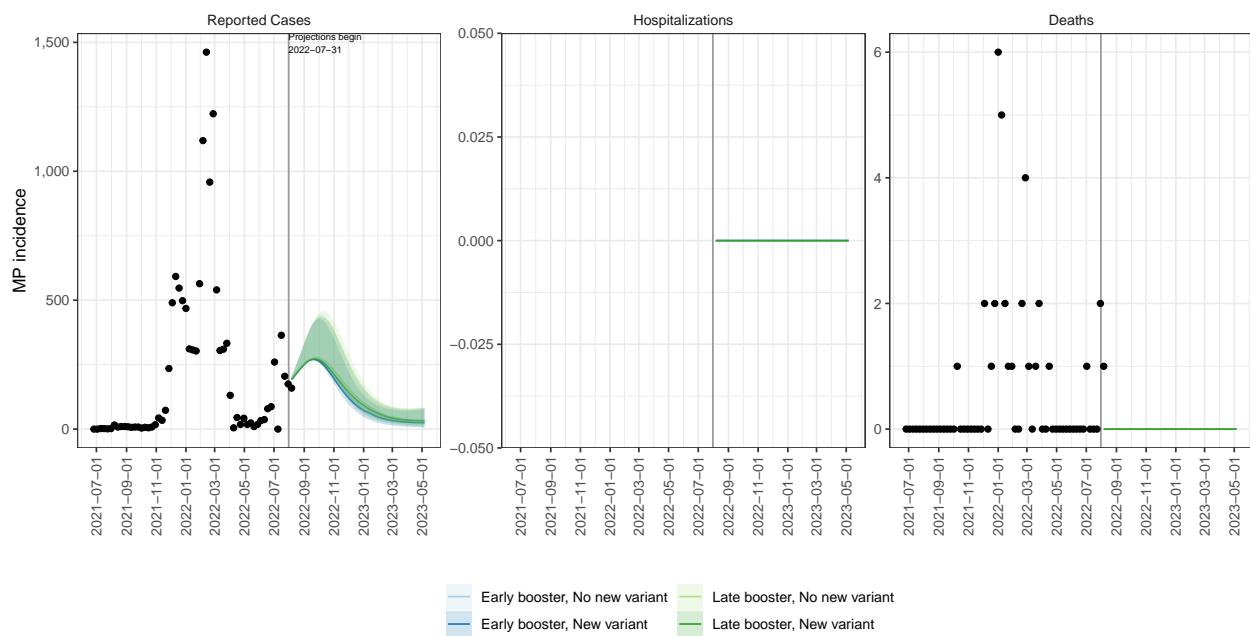


GU ensemble projections & 95% projection intervals

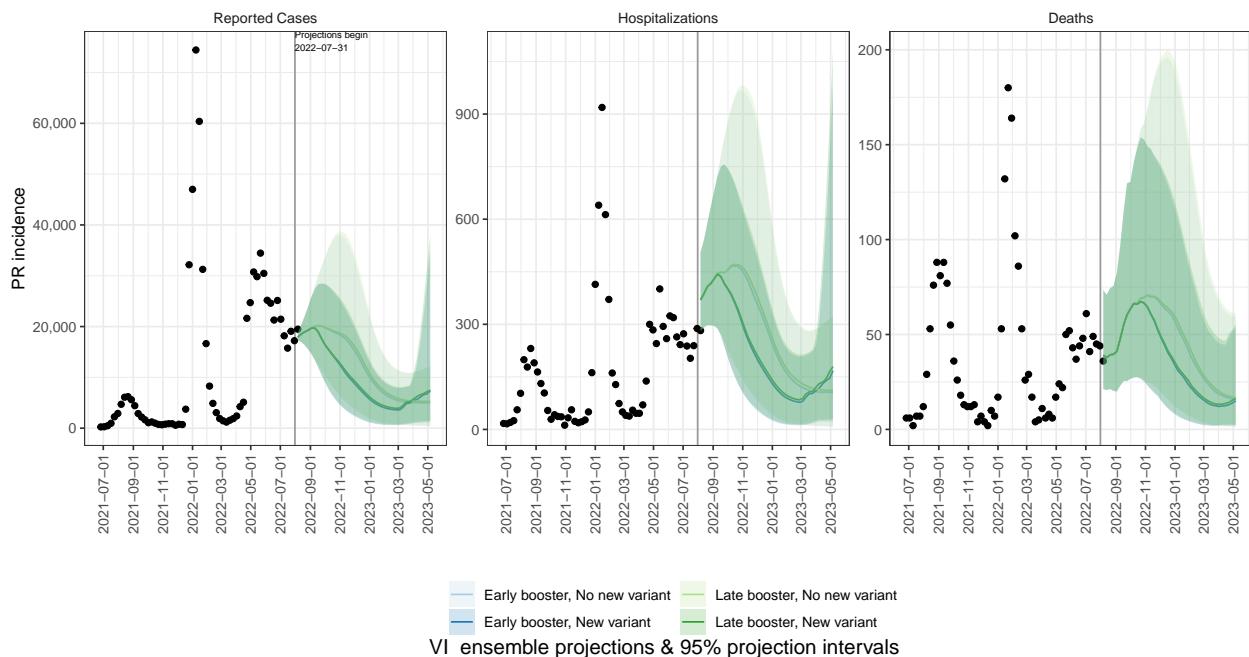


MP ensemble projections & 95% projection intervals

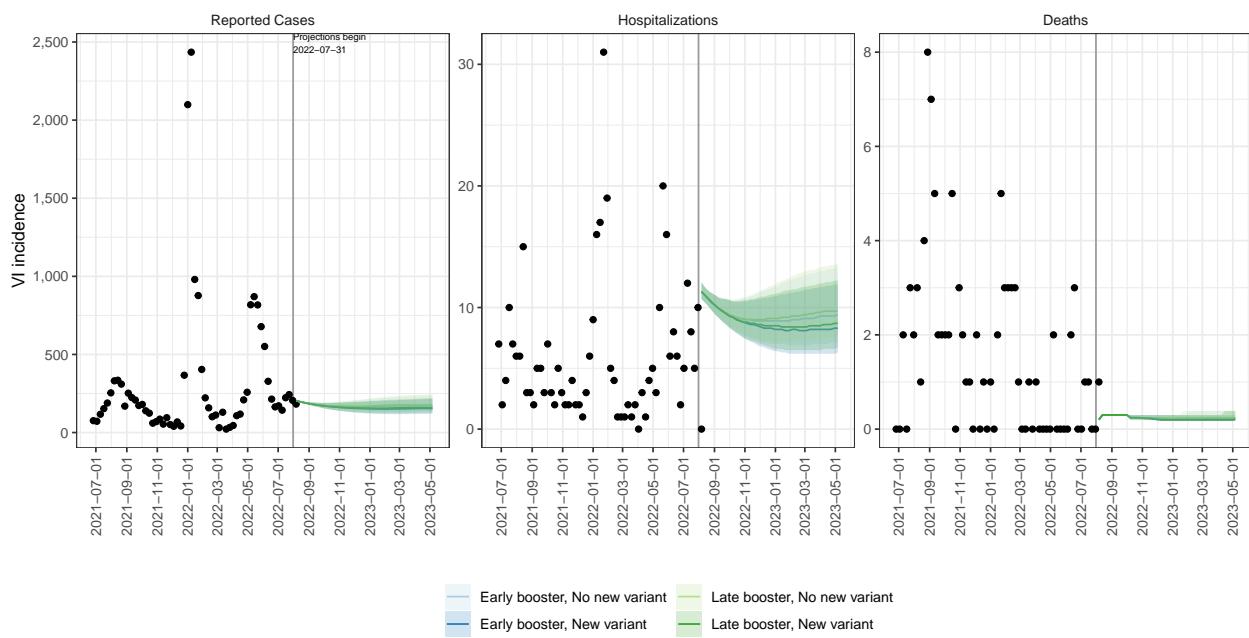
Early booster, No new variant	Late booster, No new variant
Early booster, New variant	Late booster, New variant



PR ensemble projections & 95% projection intervals



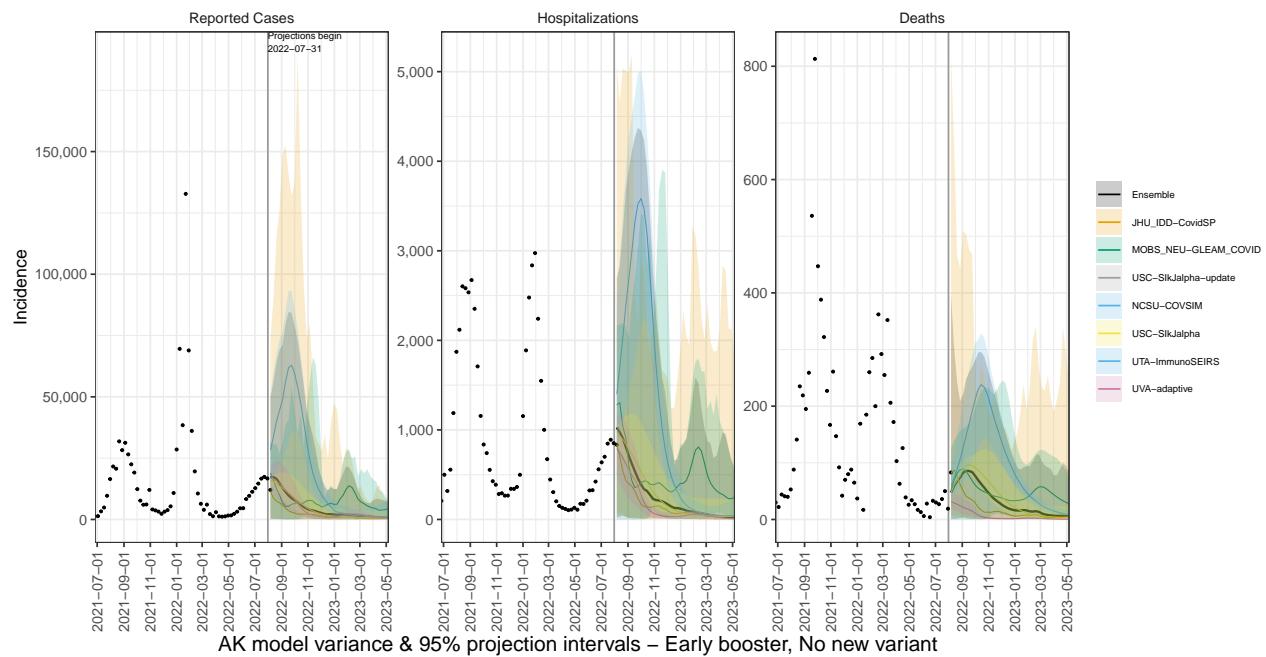
VI ensemble projections & 95% projection intervals



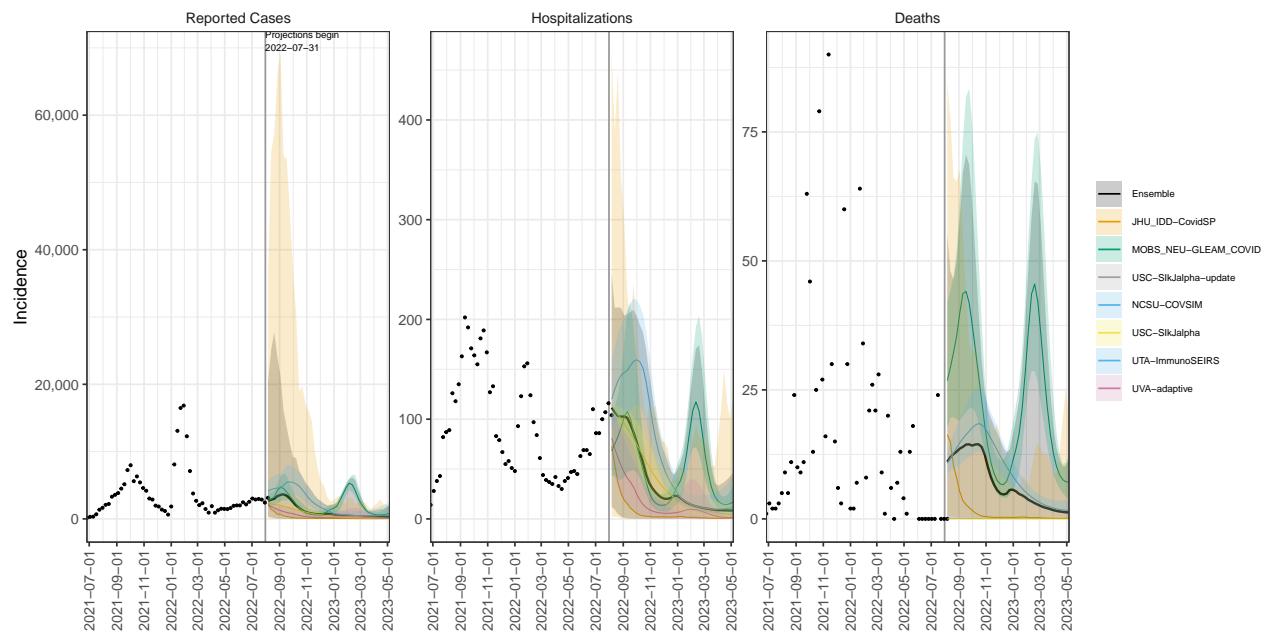
State-level model variation

National model variation for Early booster, No new variant scenario.

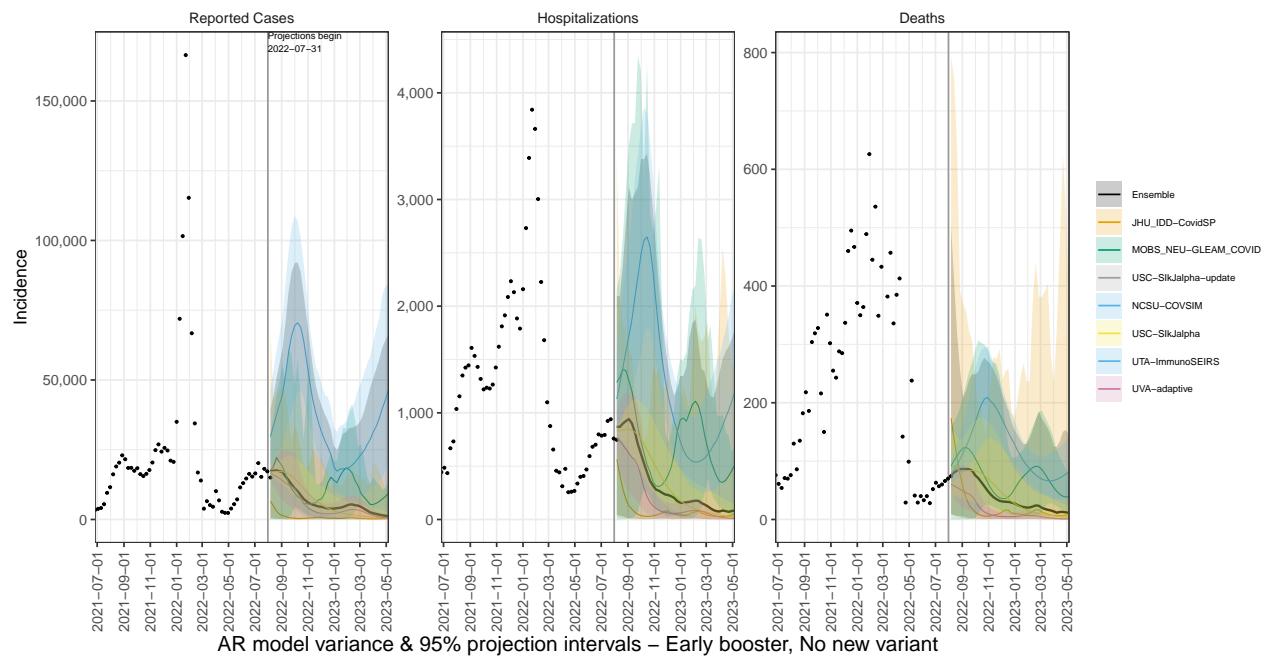
AL model variance & 95% projection intervals – Early booster, No new variant



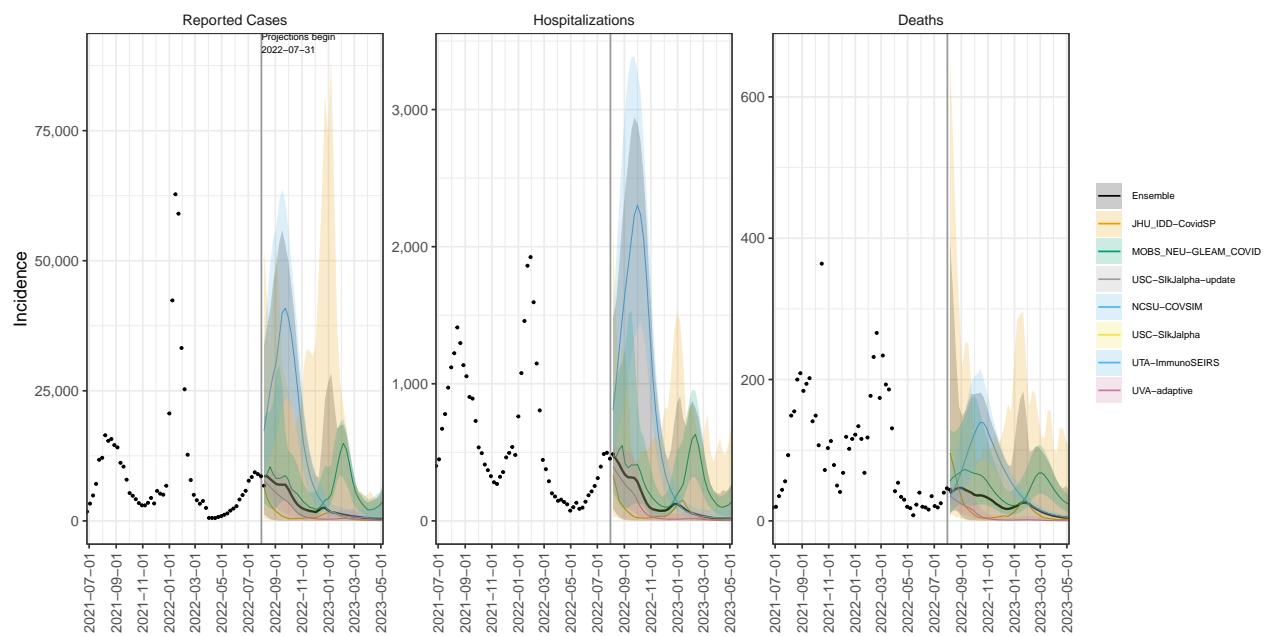
AK model variance & 95% projection intervals – Early booster, No new variant



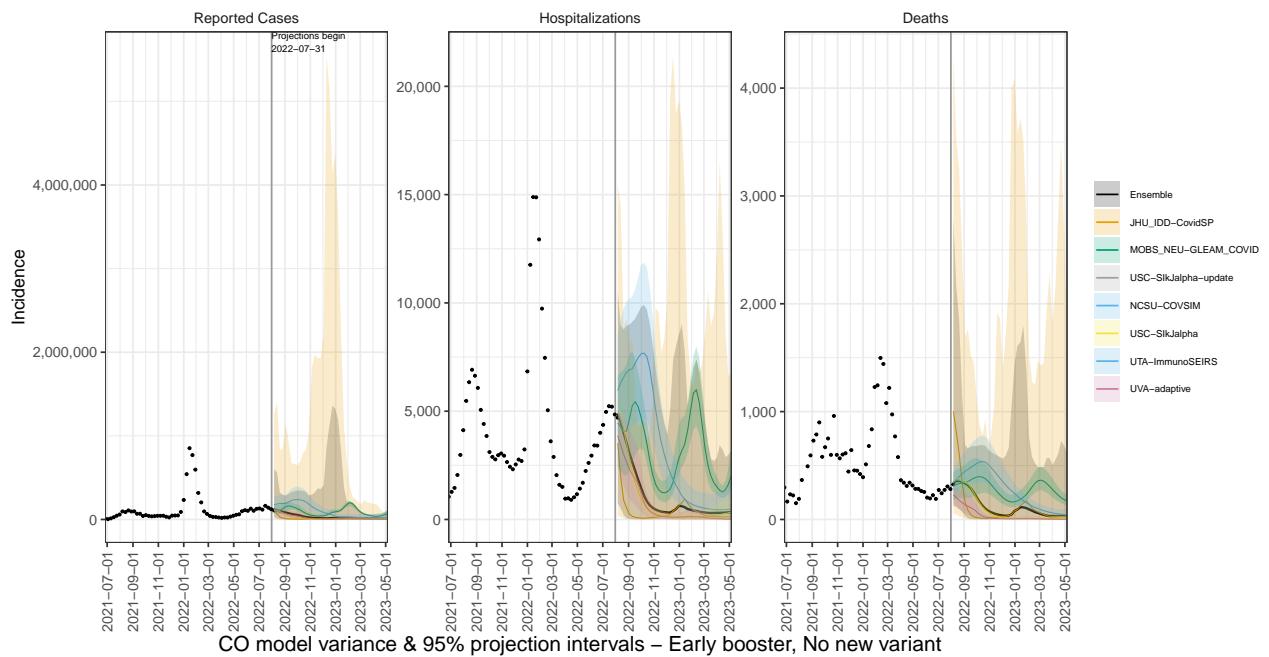
AZ model variance & 95% projection intervals – Early booster, No new variant



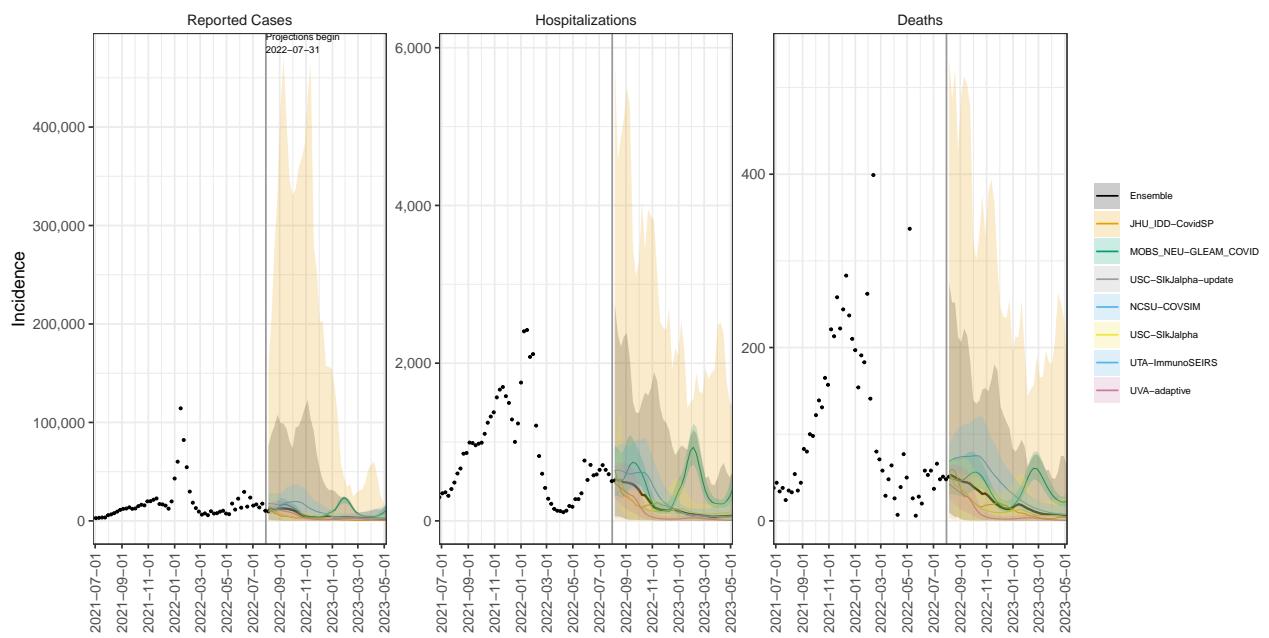
AR model variance & 95% projection intervals – Early booster, No new variant



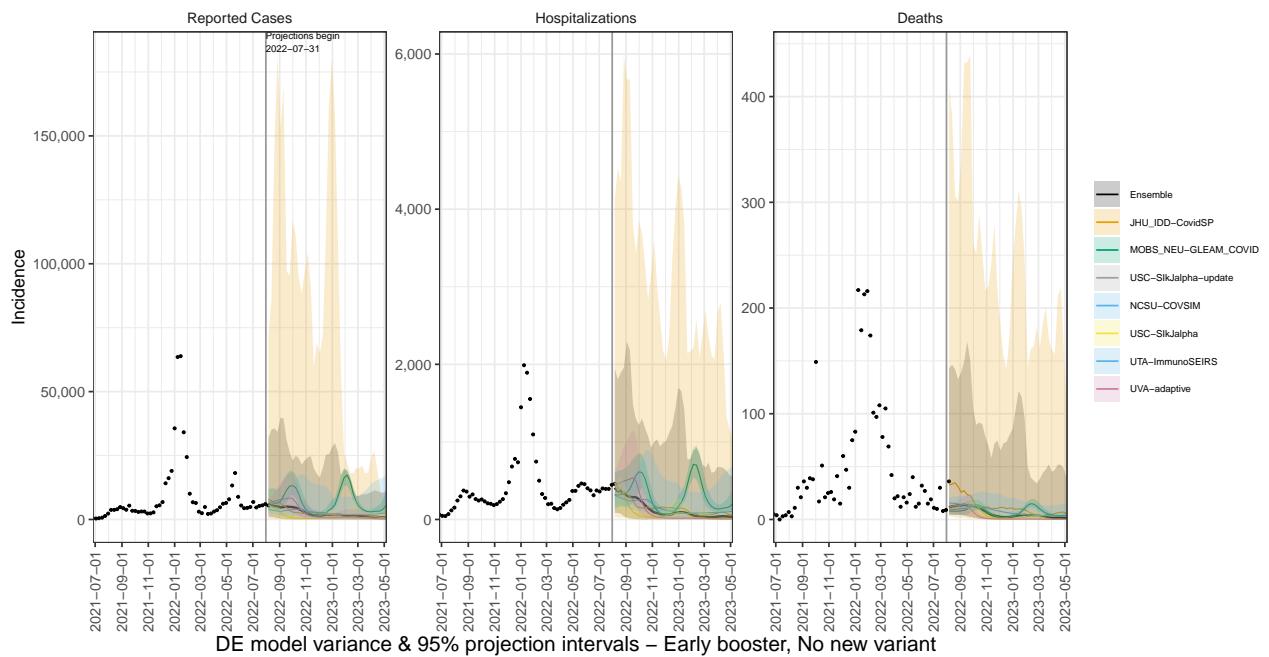
CA model variance & 95% projection intervals – Early booster, No new variant



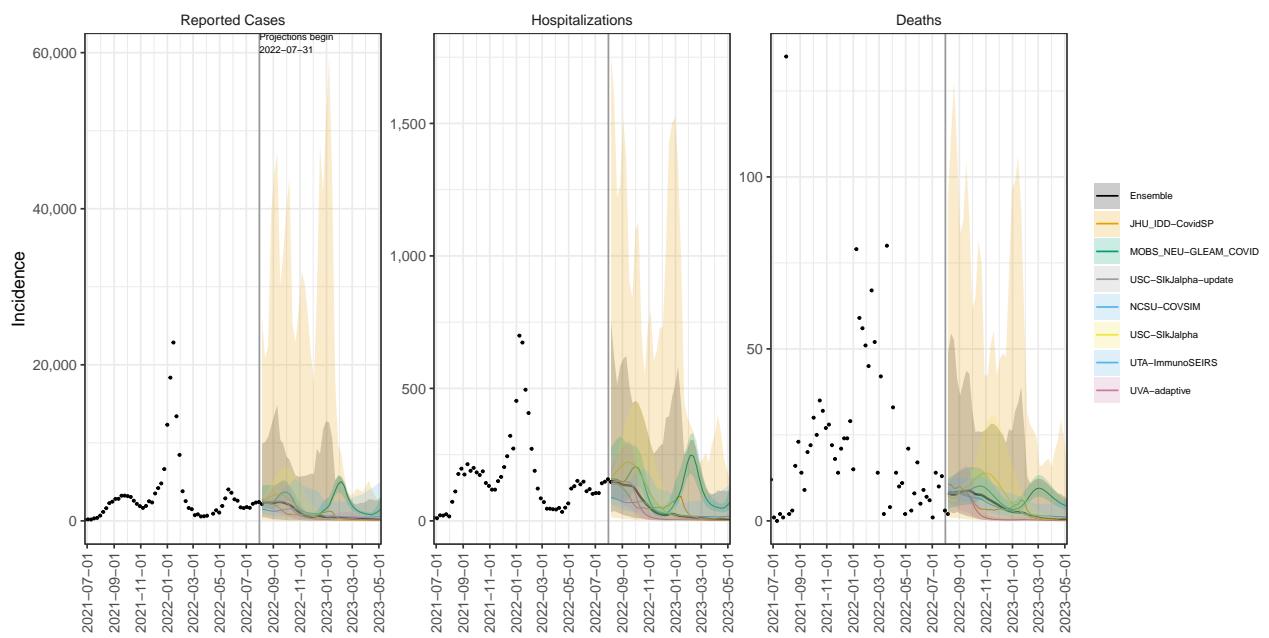
CO model variance & 95% projection intervals – Early booster, No new variant



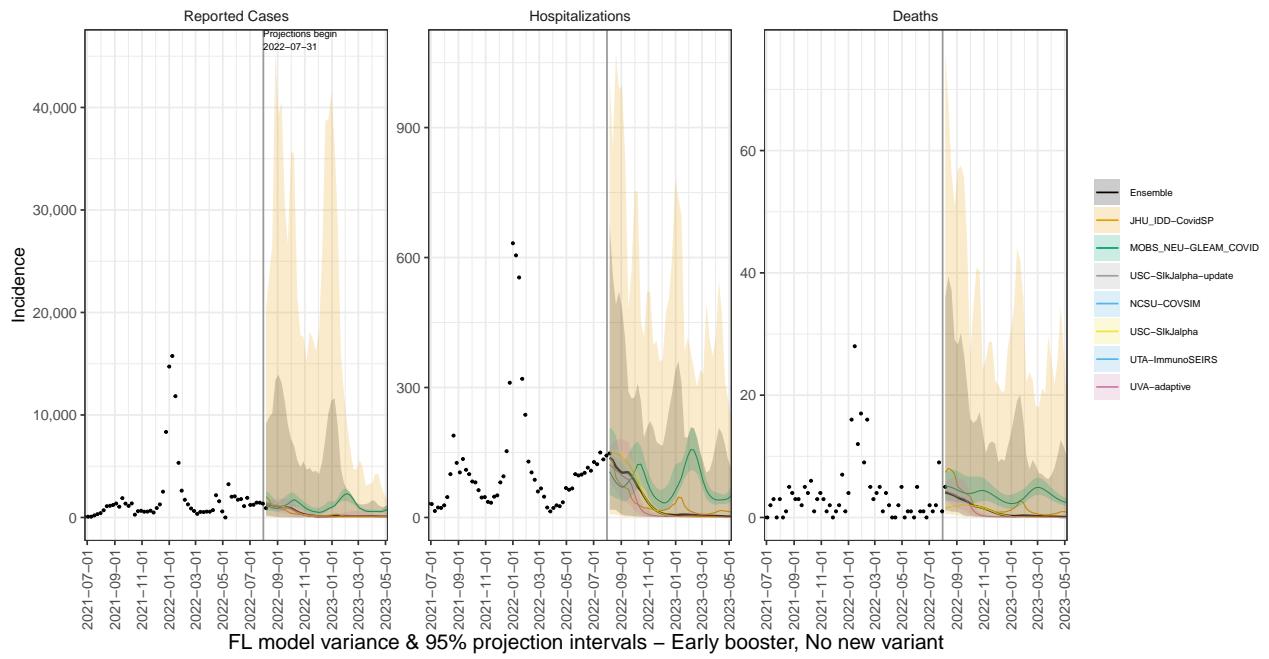
CT model variance & 95% projection intervals – Early booster, No new variant



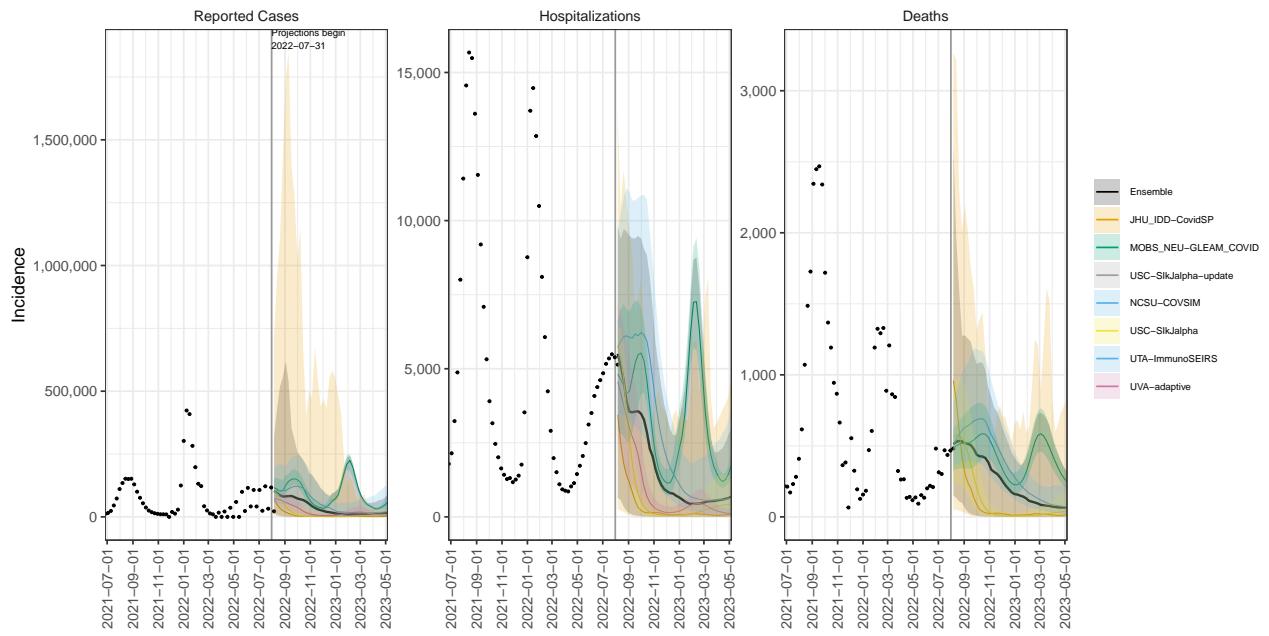
DE model variance & 95% projection intervals – Early booster, No new variant



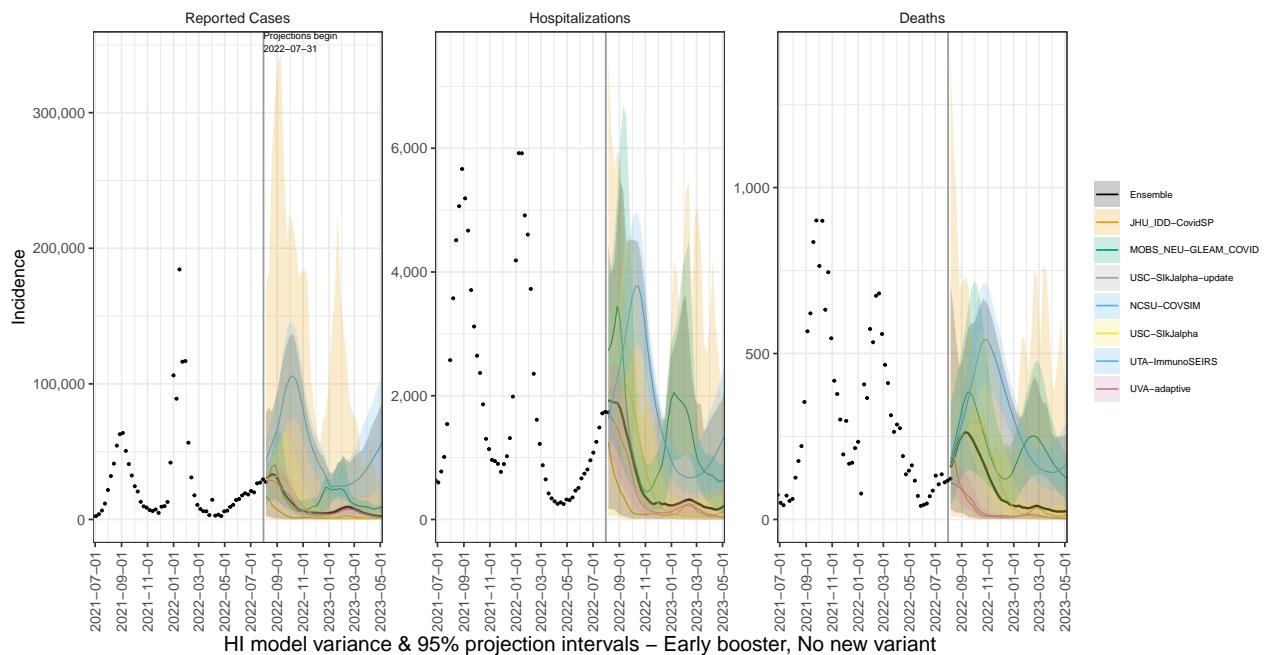
DC model variance & 95% projection intervals – Early booster, No new variant



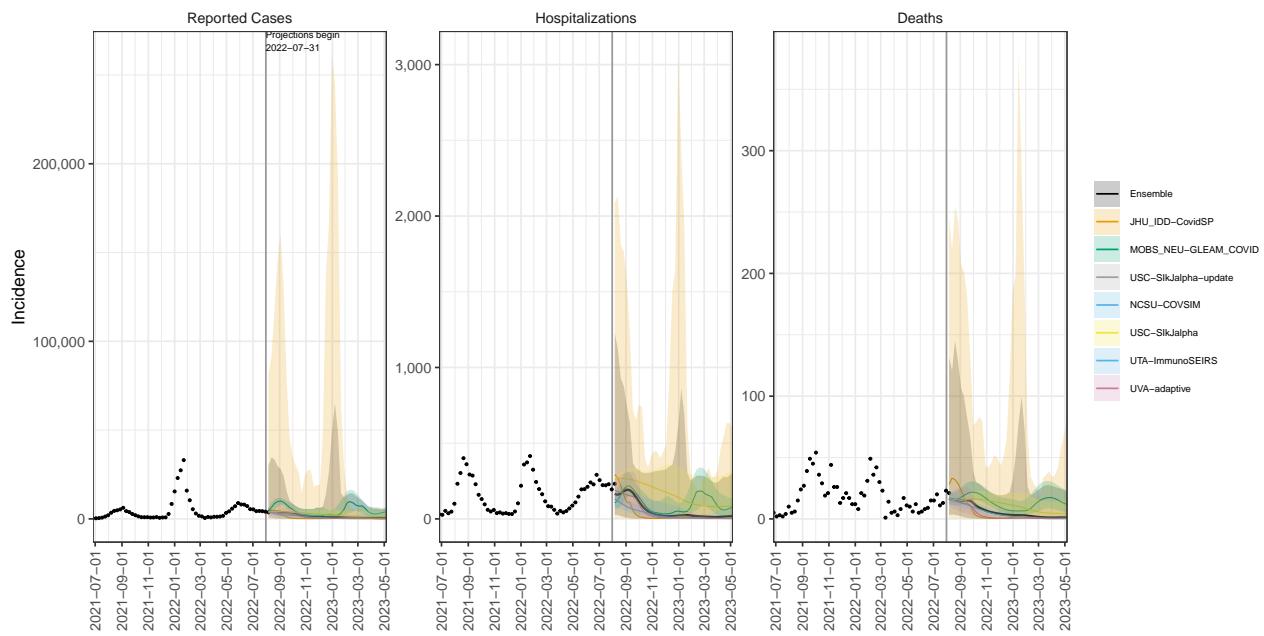
FL model variance & 95% projection intervals – Early booster, No new variant



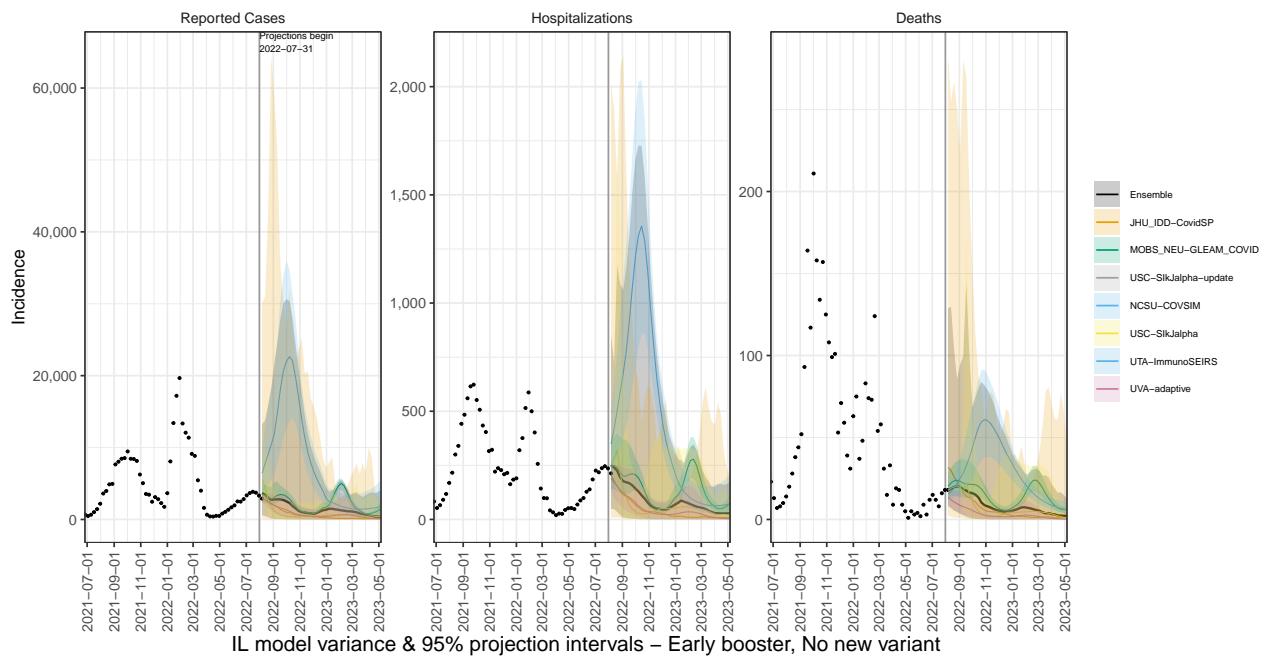
GA model variance & 95% projection intervals – Early booster, No new variant



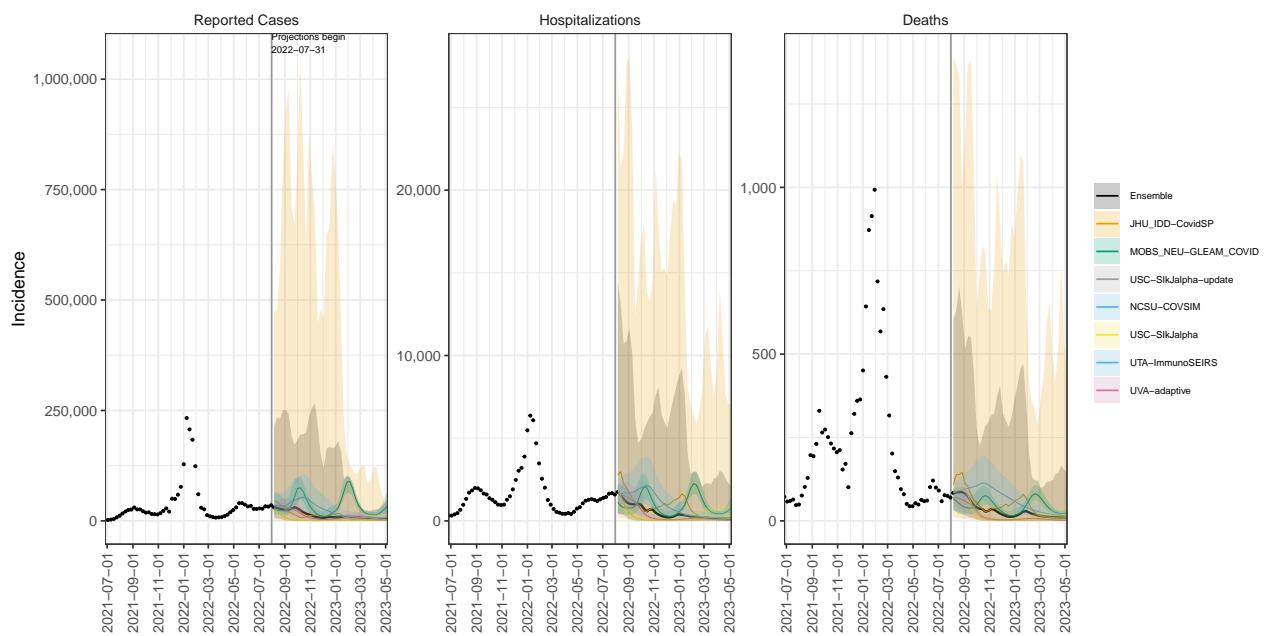
HI model variance & 95% projection intervals – Early booster, No new variant



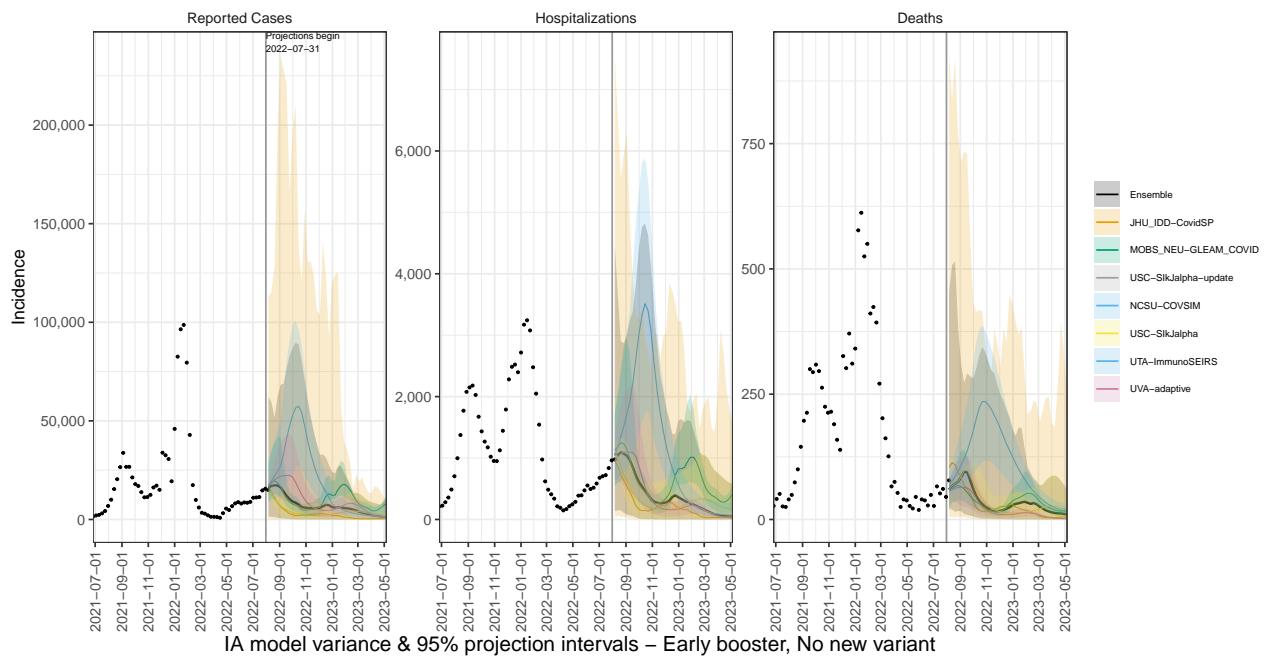
ID model variance & 95% projection intervals – Early booster, No new variant



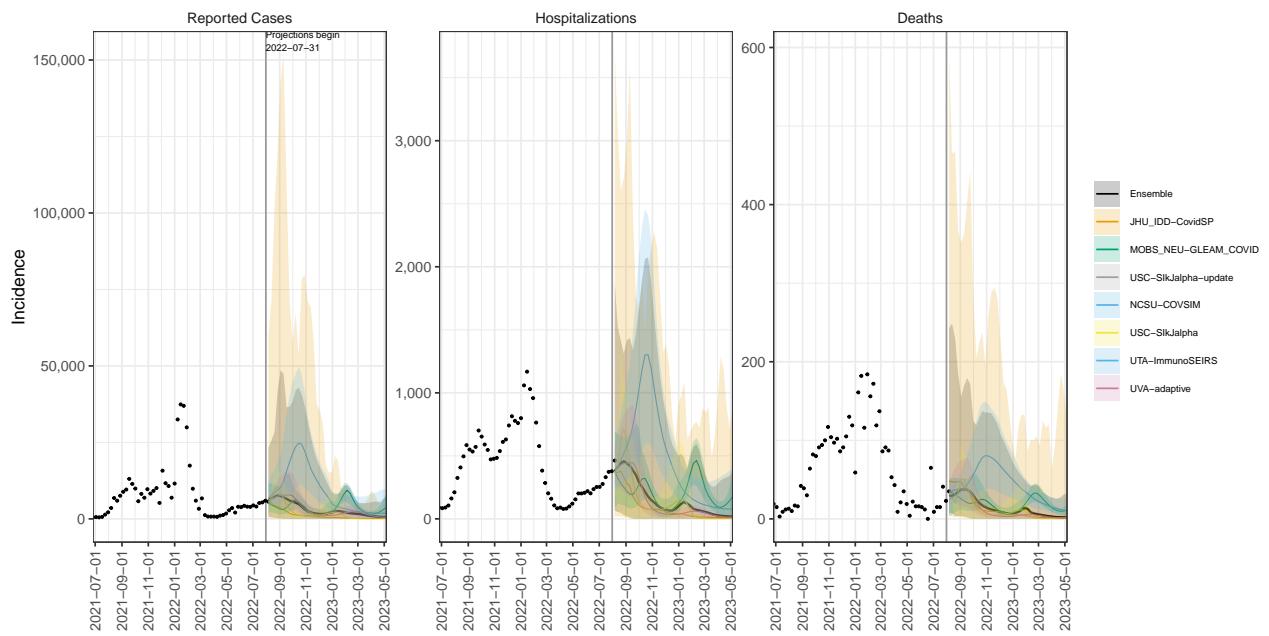
IL model variance & 95% projection intervals – Early booster, No new variant



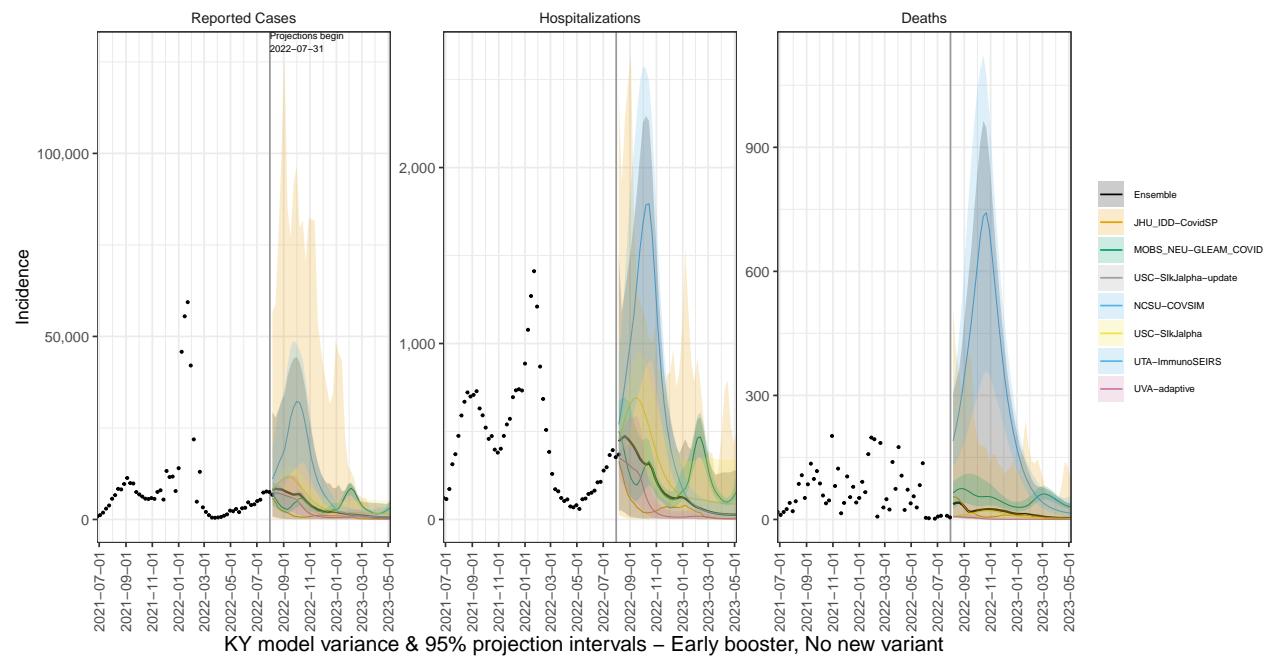
IN model variance & 95% projection intervals – Early booster, No new variant



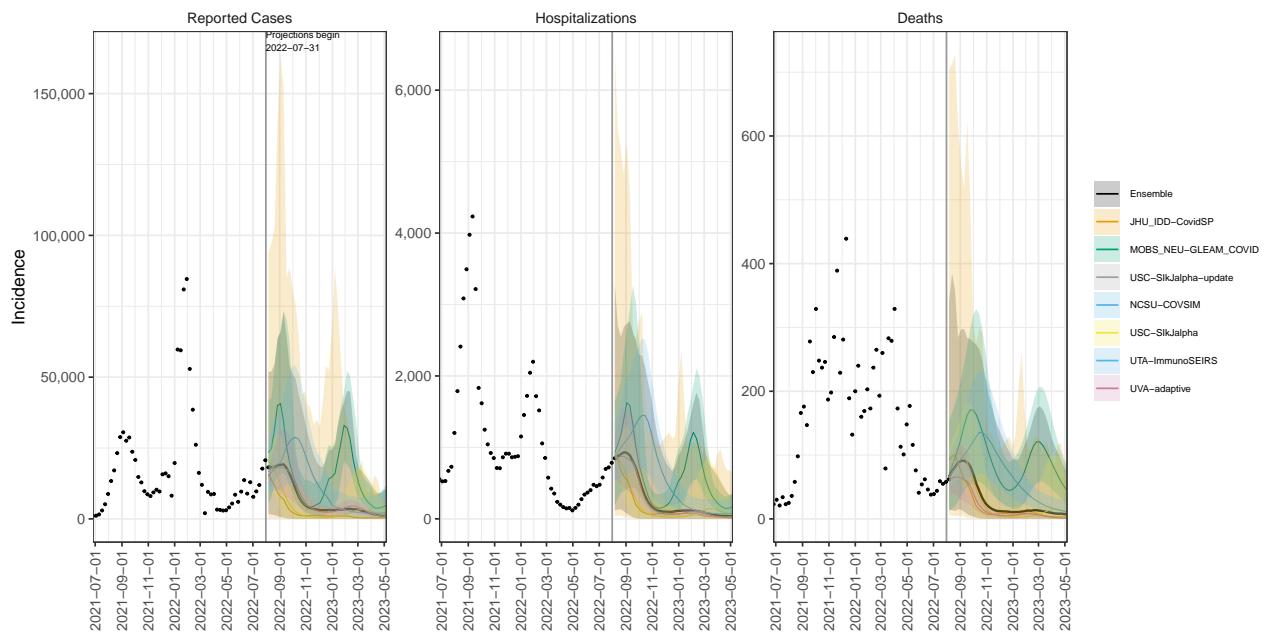
IA model variance & 95% projection intervals – Early booster, No new variant



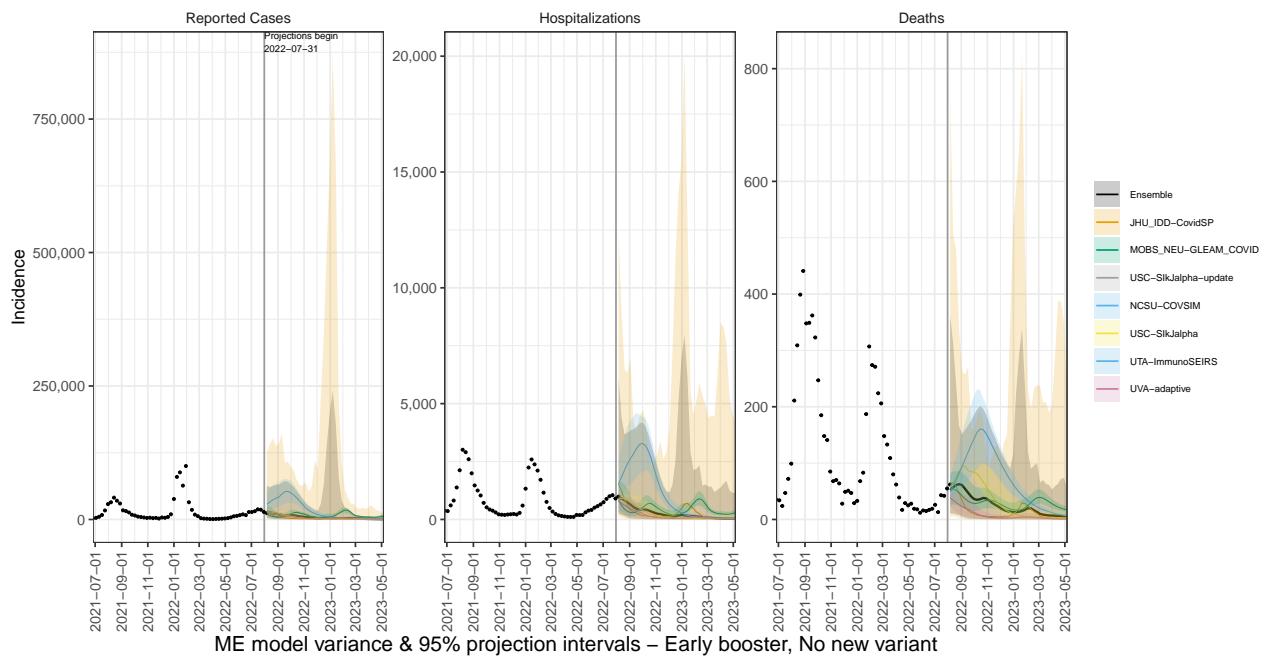
KS model variance & 95% projection intervals – Early booster, No new variant



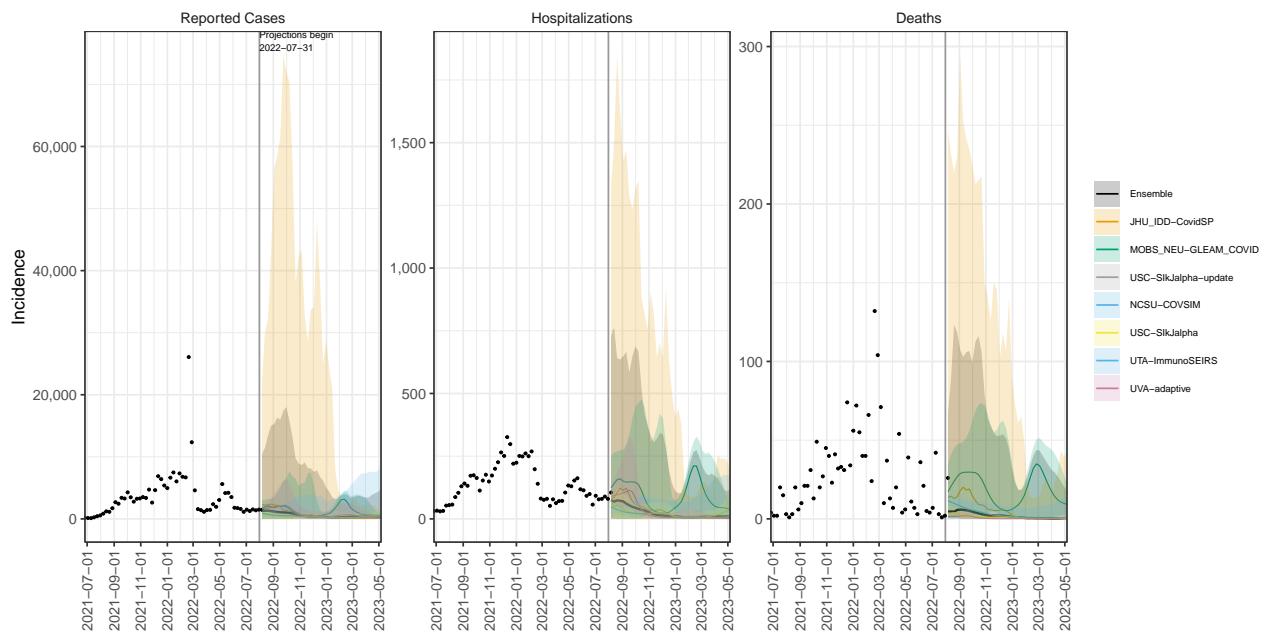
KY model variance & 95% projection intervals – Early booster, No new variant



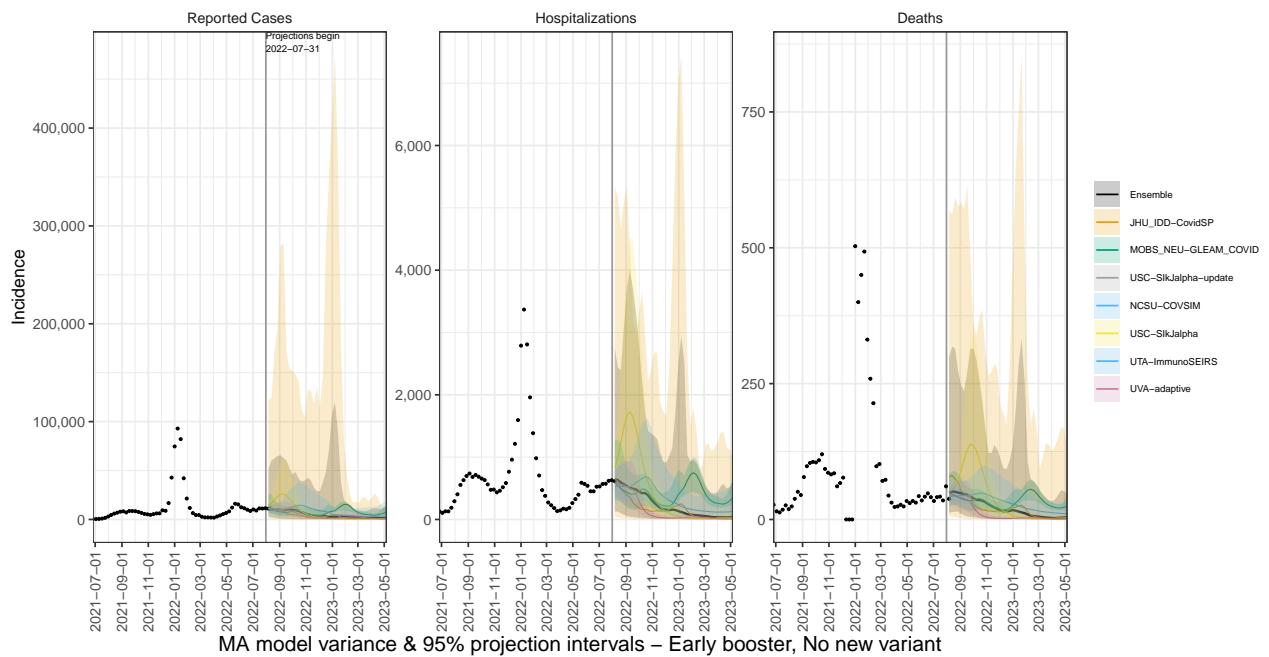
LA model variance & 95% projection intervals – Early booster, No new variant



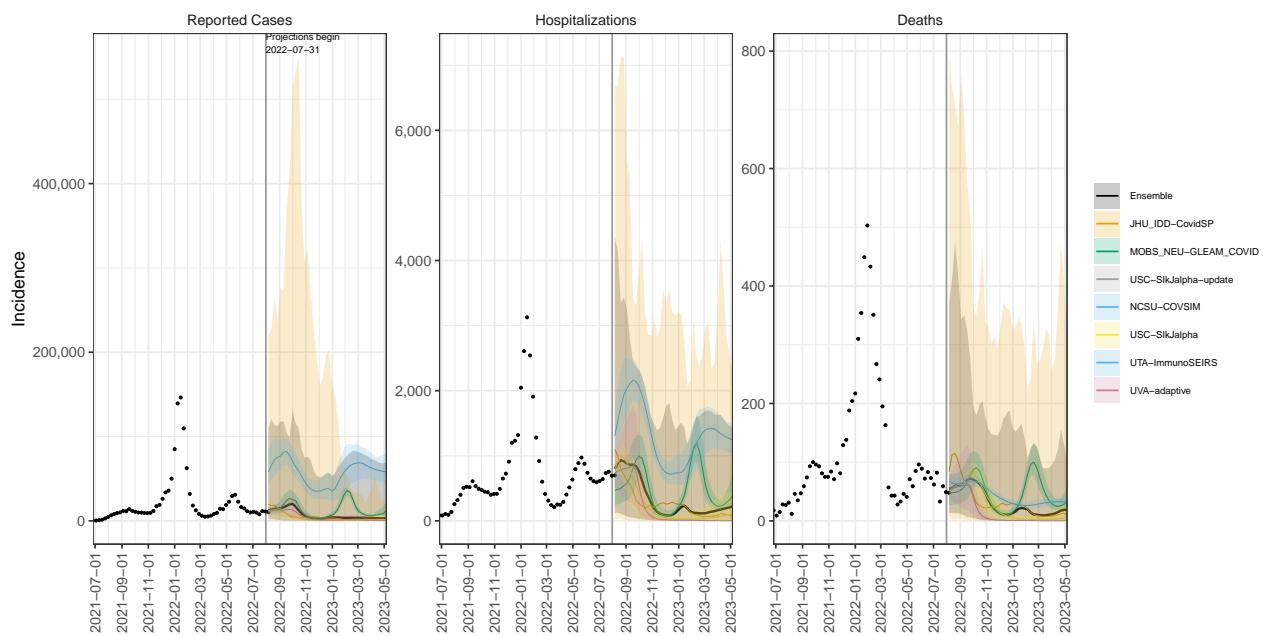
ME model variance & 95% projection intervals – Early booster, No new variant



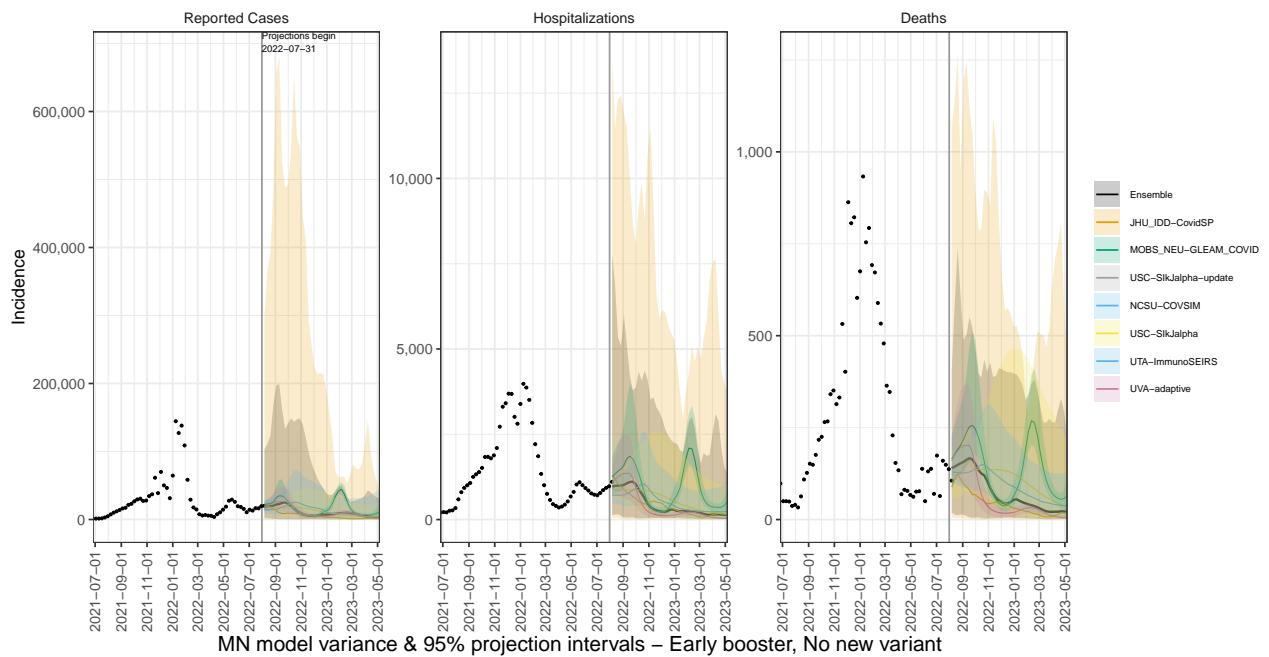
MD model variance & 95% projection intervals – Early booster, No new variant



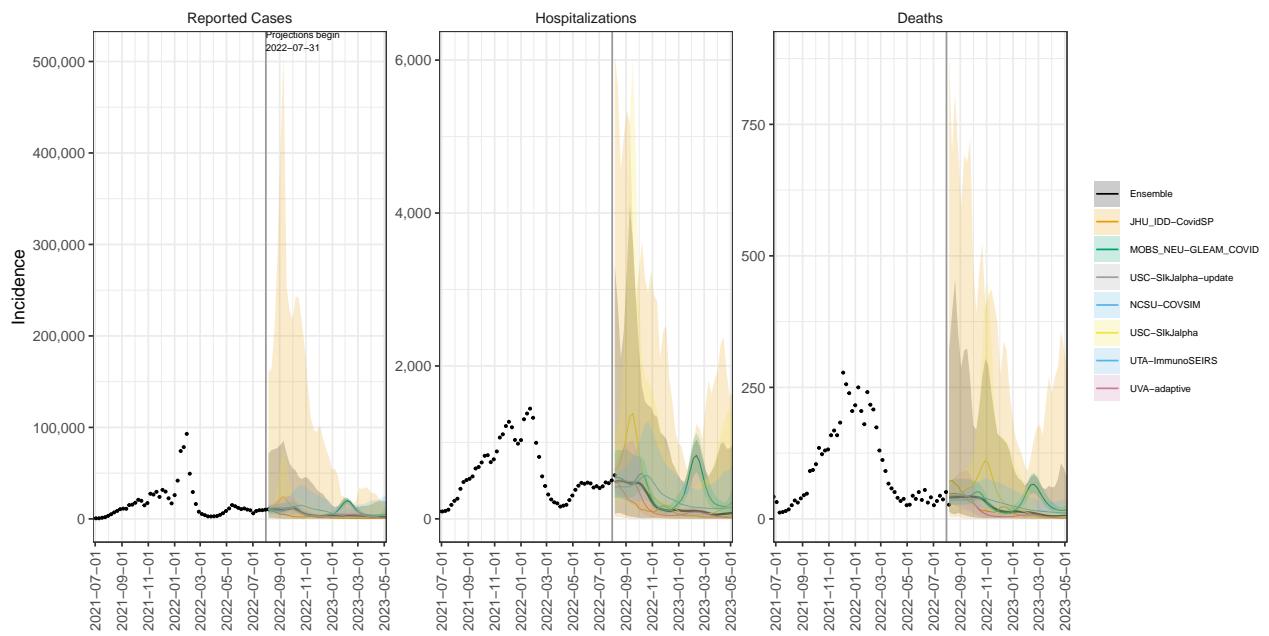
MA model variance & 95% projection intervals – Early booster, No new variant



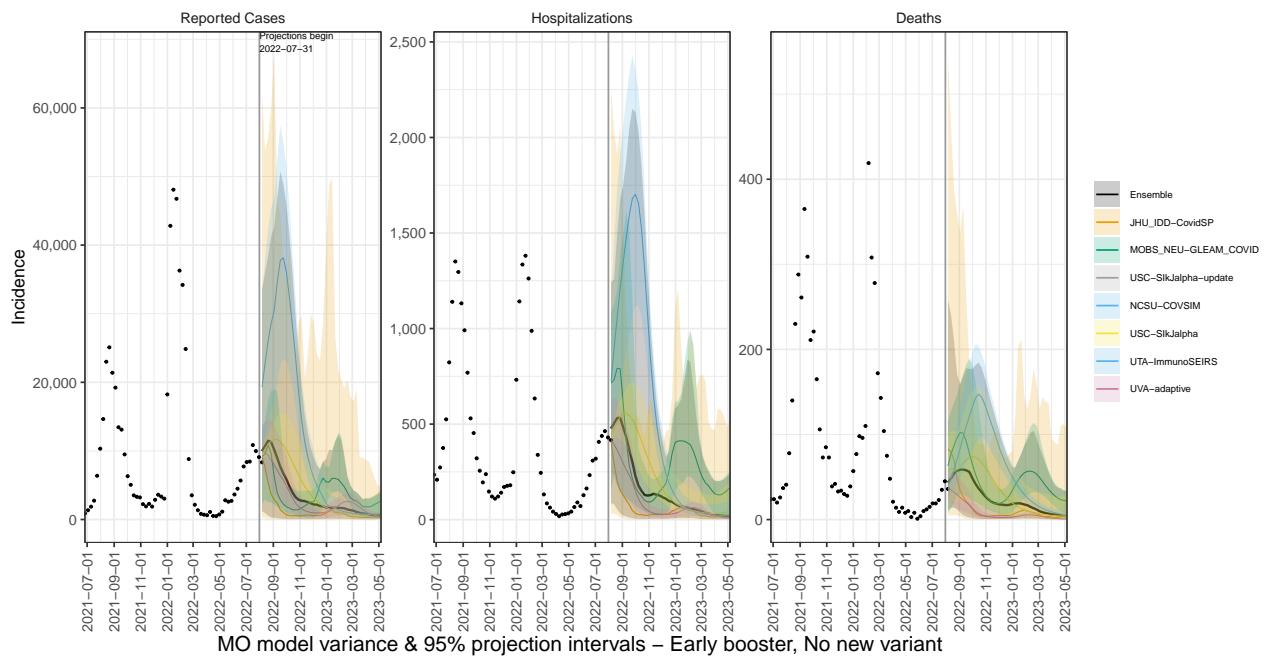
MI model variance & 95% projection intervals – Early booster, No new variant



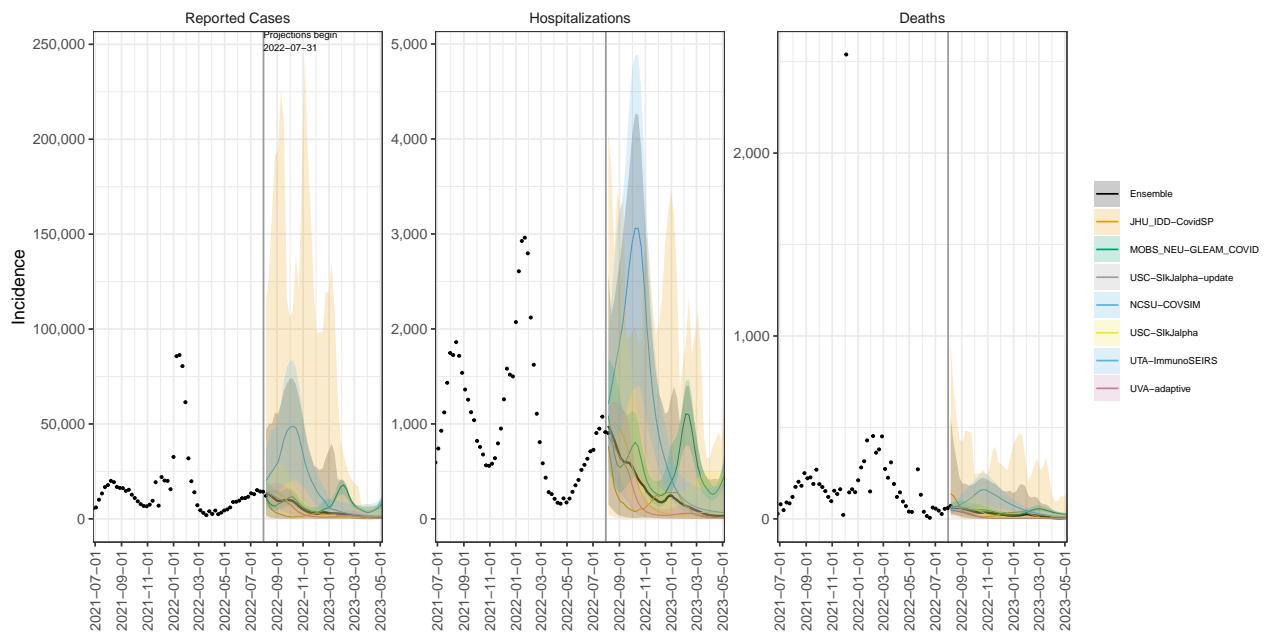
MN model variance & 95% projection intervals – Early booster, No new variant



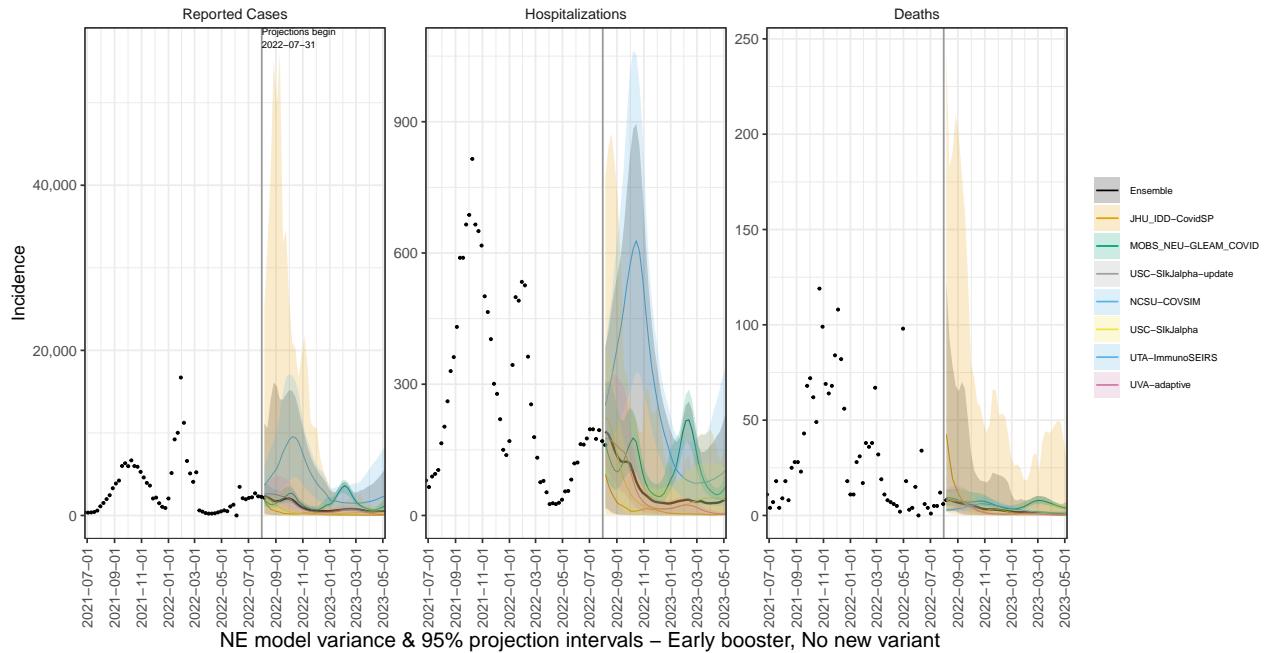
MS model variance & 95% projection intervals – Early booster, No new variant



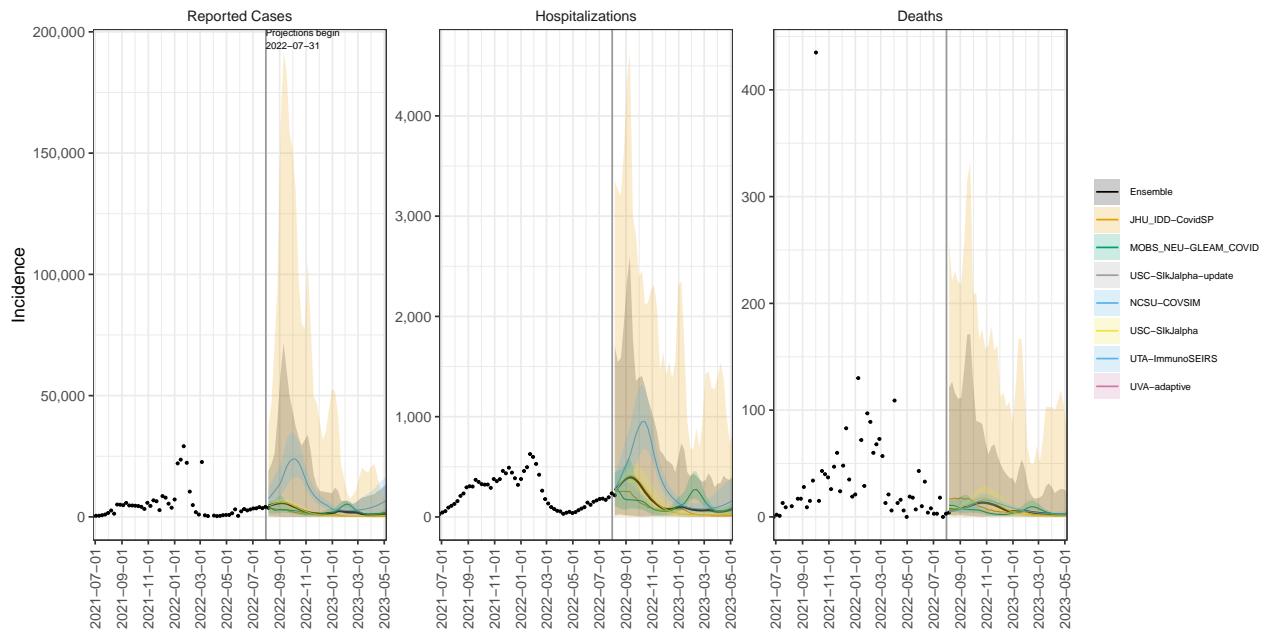
MO model variance & 95% projection intervals – Early booster, No new variant



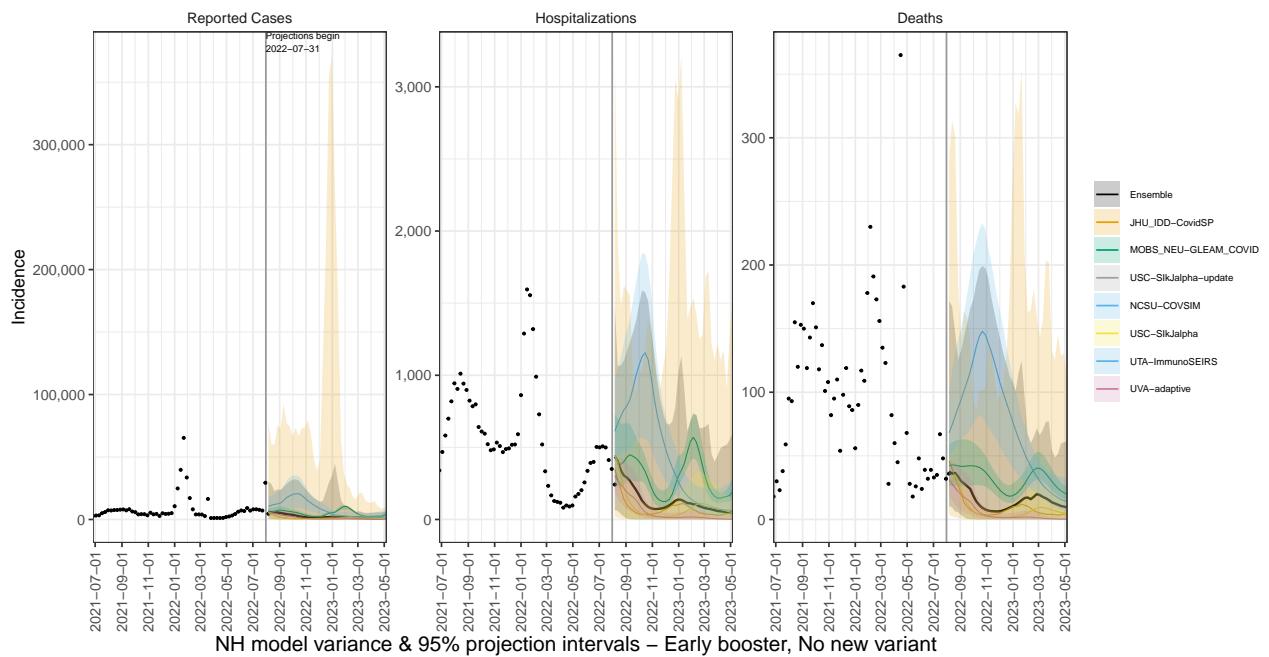
MT model variance & 95% projection intervals – Early booster, No new variant



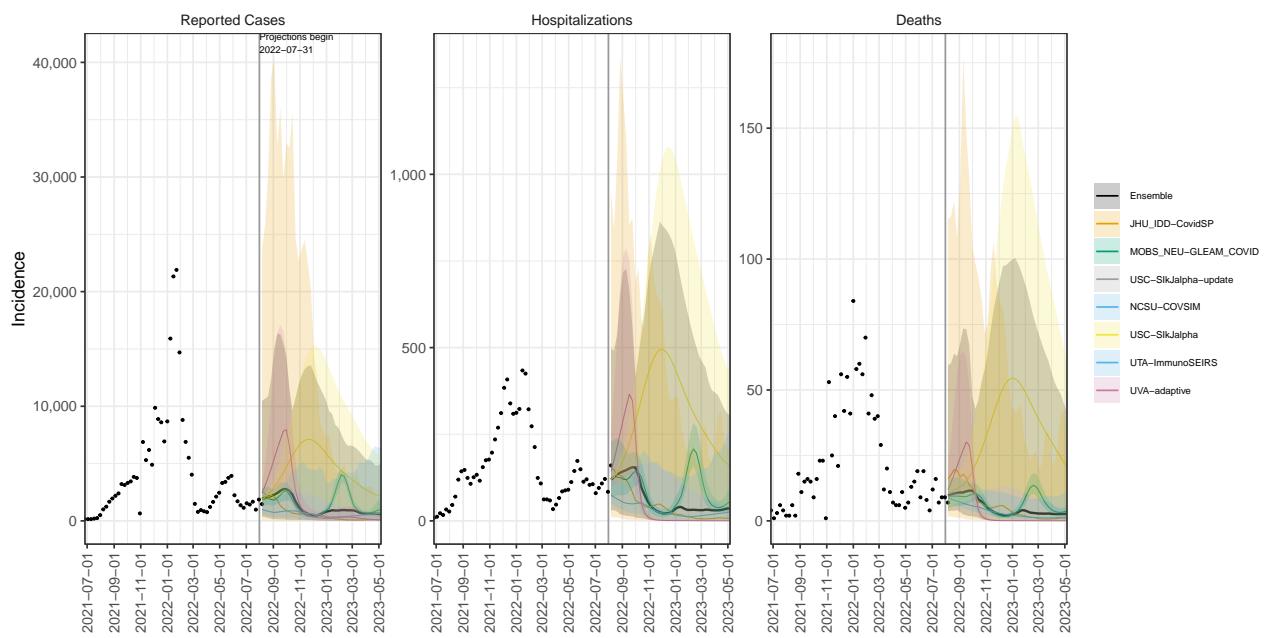
NE model variance & 95% projection intervals – Early booster, No new variant



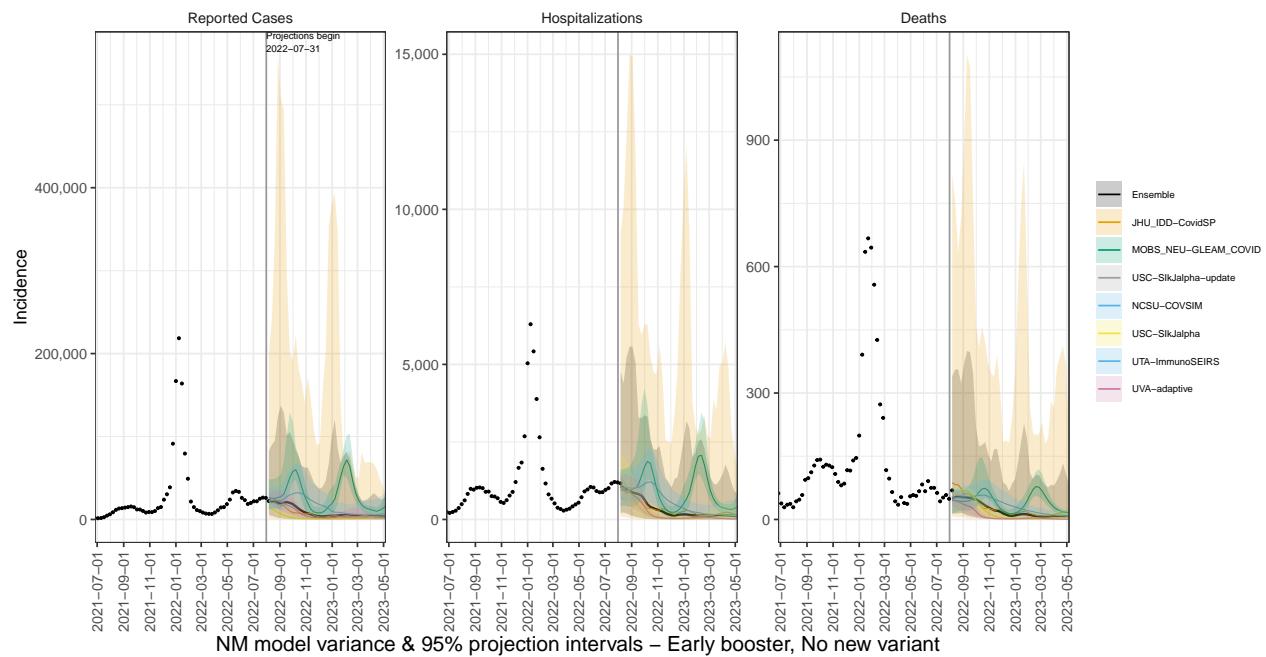
NV model variance & 95% projection intervals – Early booster, No new variant



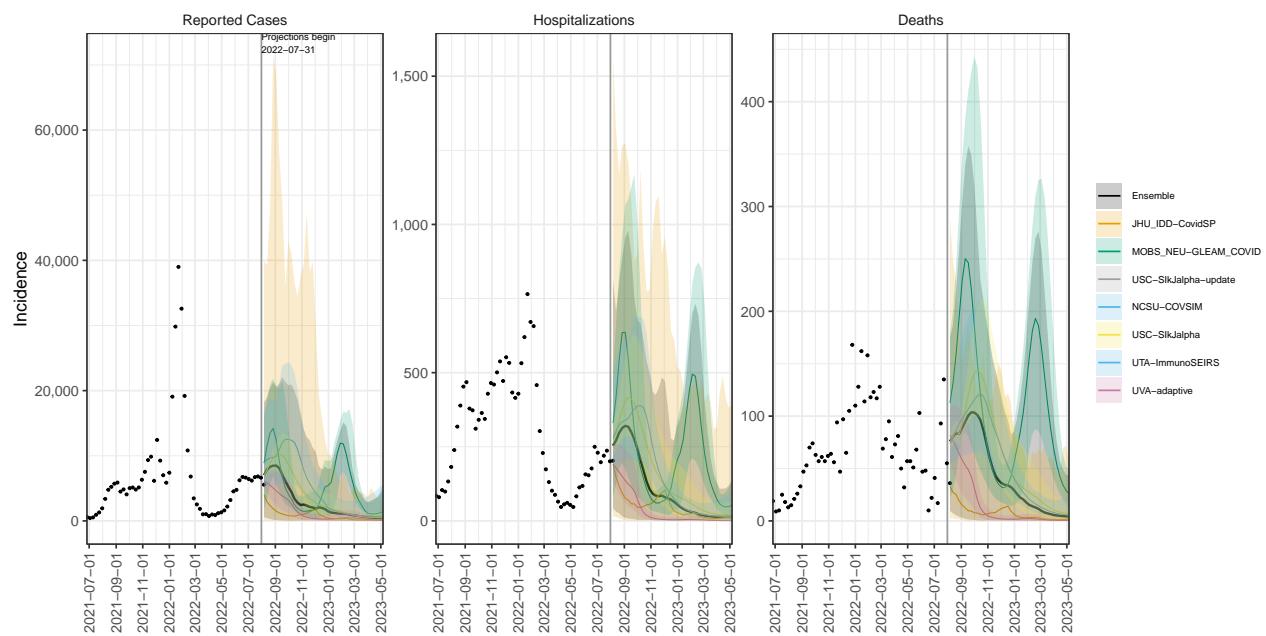
NH model variance & 95% projection intervals – Early booster, No new variant



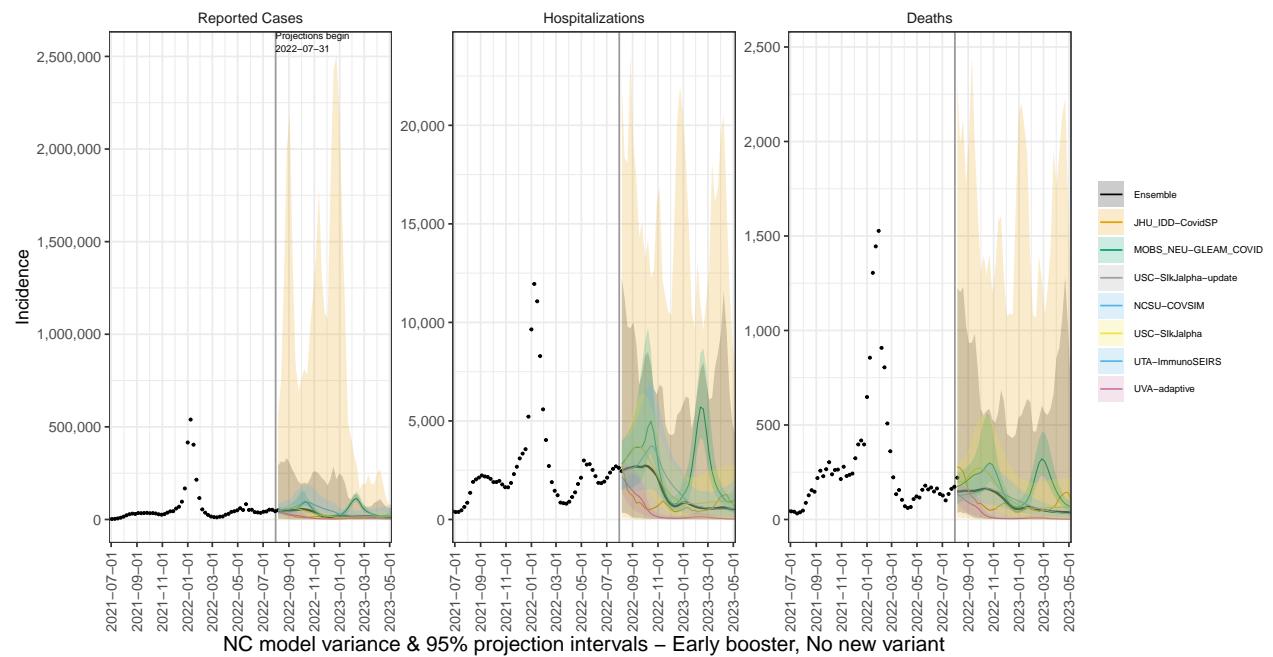
NJ model variance & 95% projection intervals – Early booster, No new variant



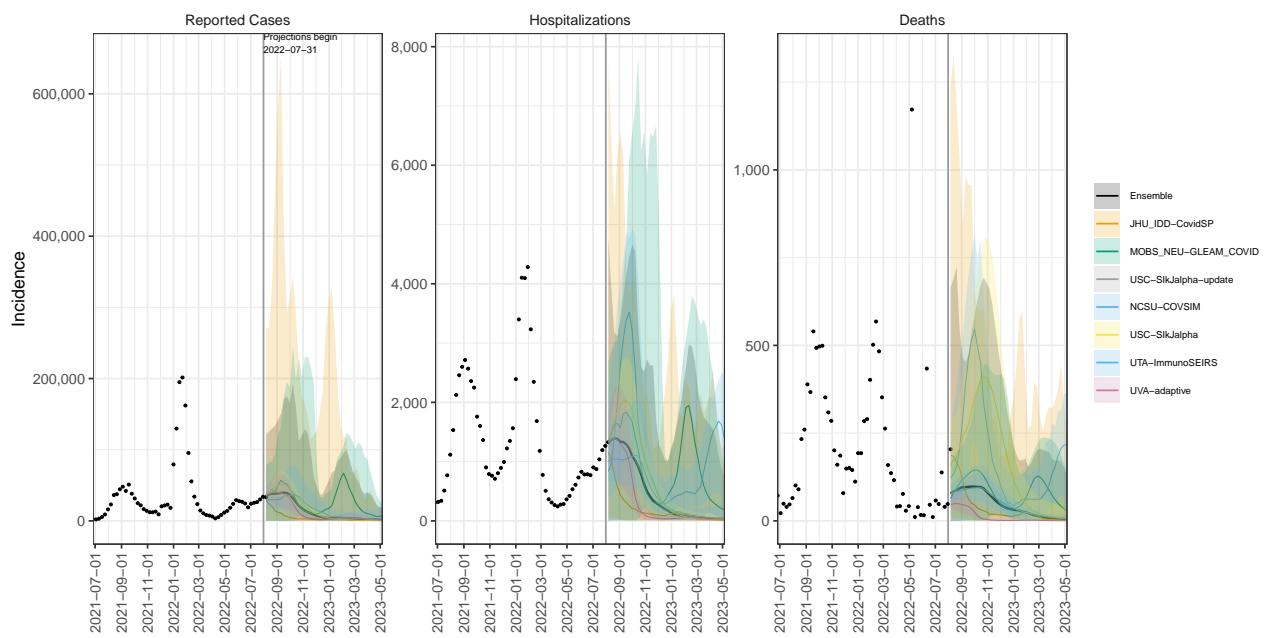
NM model variance & 95% projection intervals – Early booster, No new variant



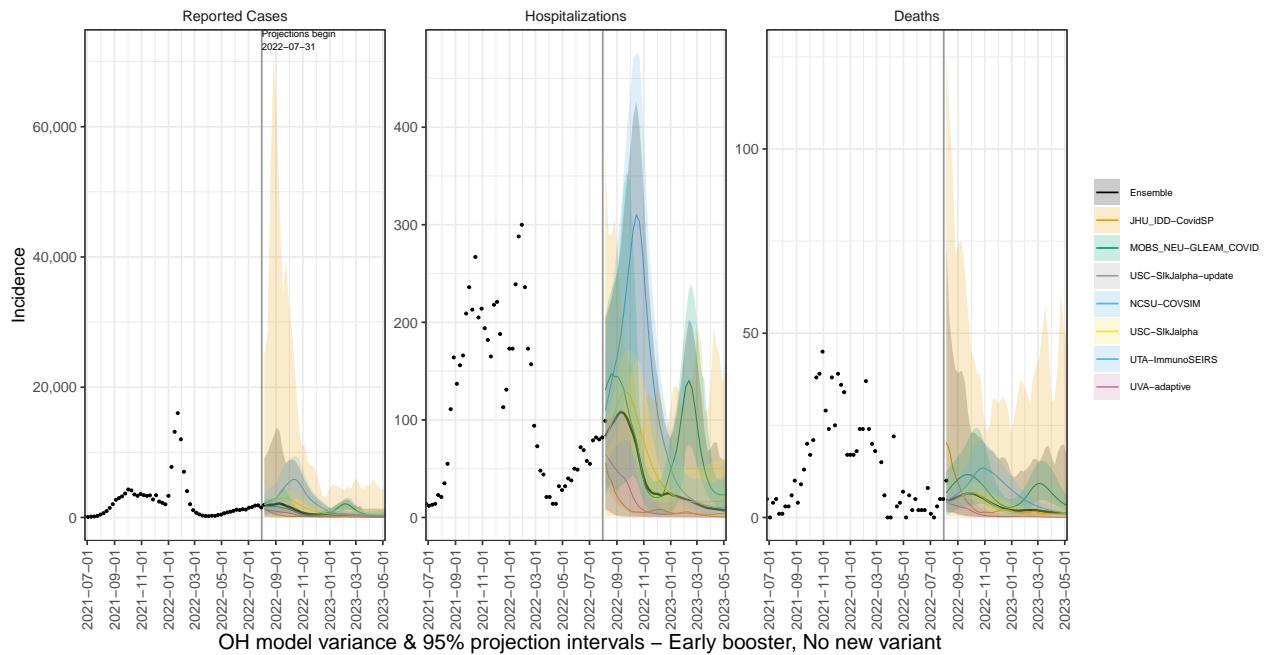
NY model variance & 95% projection intervals – Early booster, No new variant



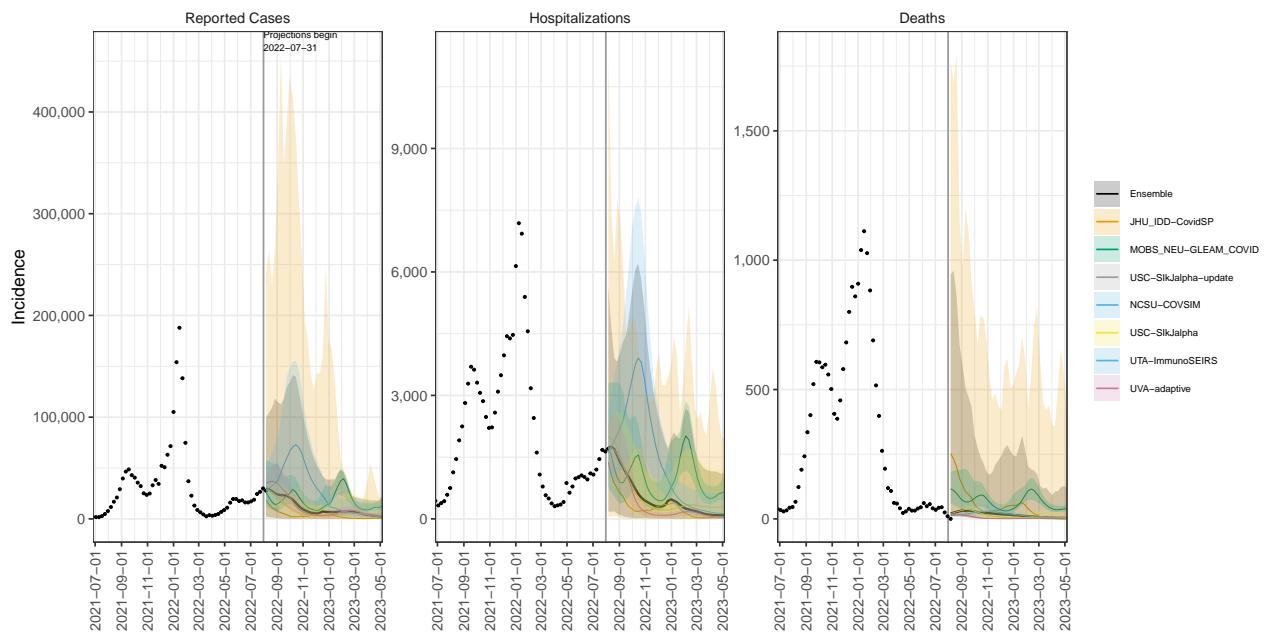
NC model variance & 95% projection intervals – Early booster, No new variant



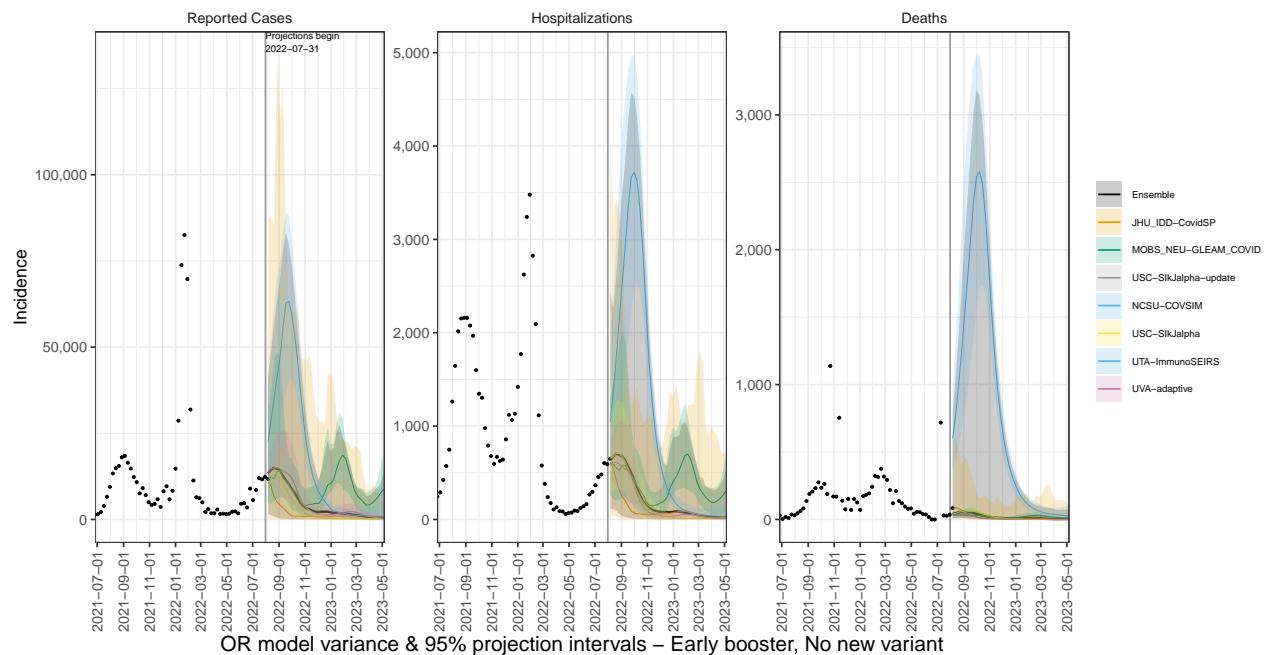
ND model variance & 95% projection intervals – Early booster, No new variant



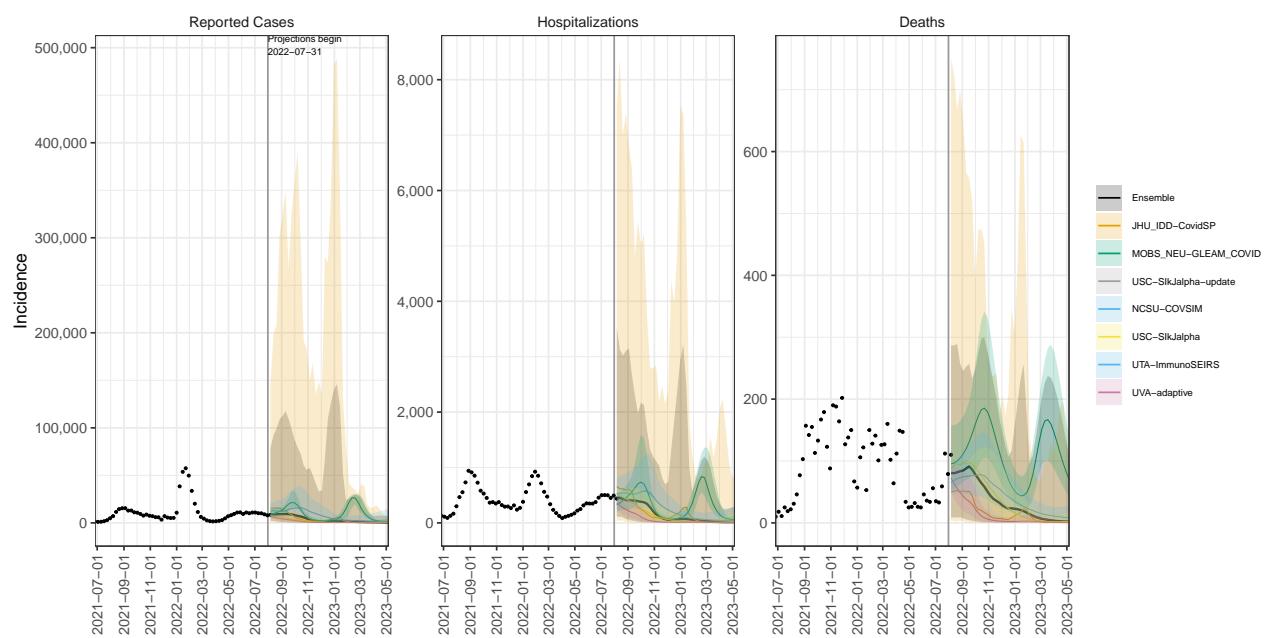
OH model variance & 95% projection intervals – Early booster, No new variant



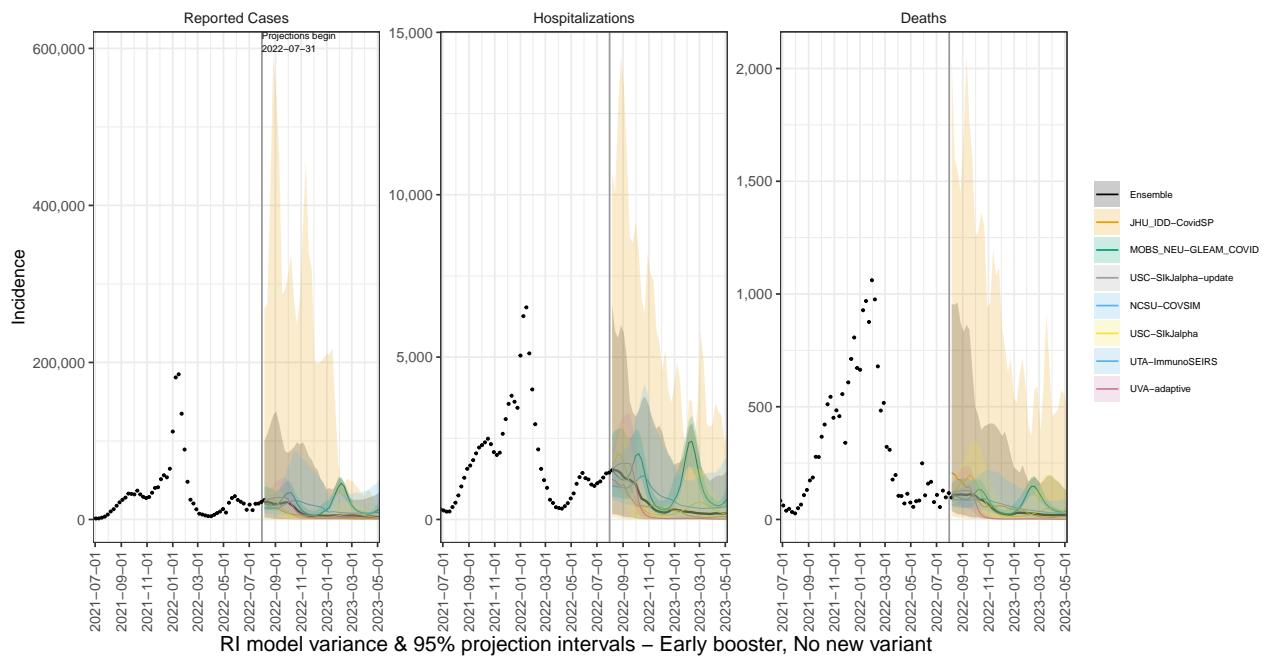
OK model variance & 95% projection intervals – Early booster, No new variant



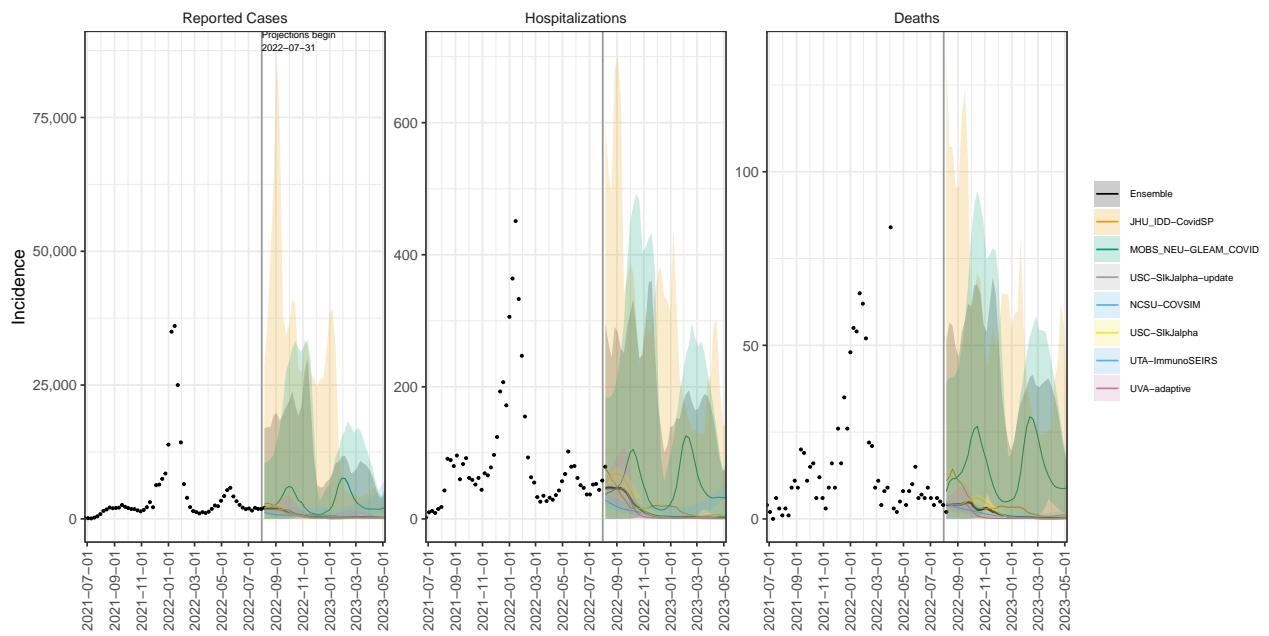
OR model variance & 95% projection intervals – Early booster, No new variant



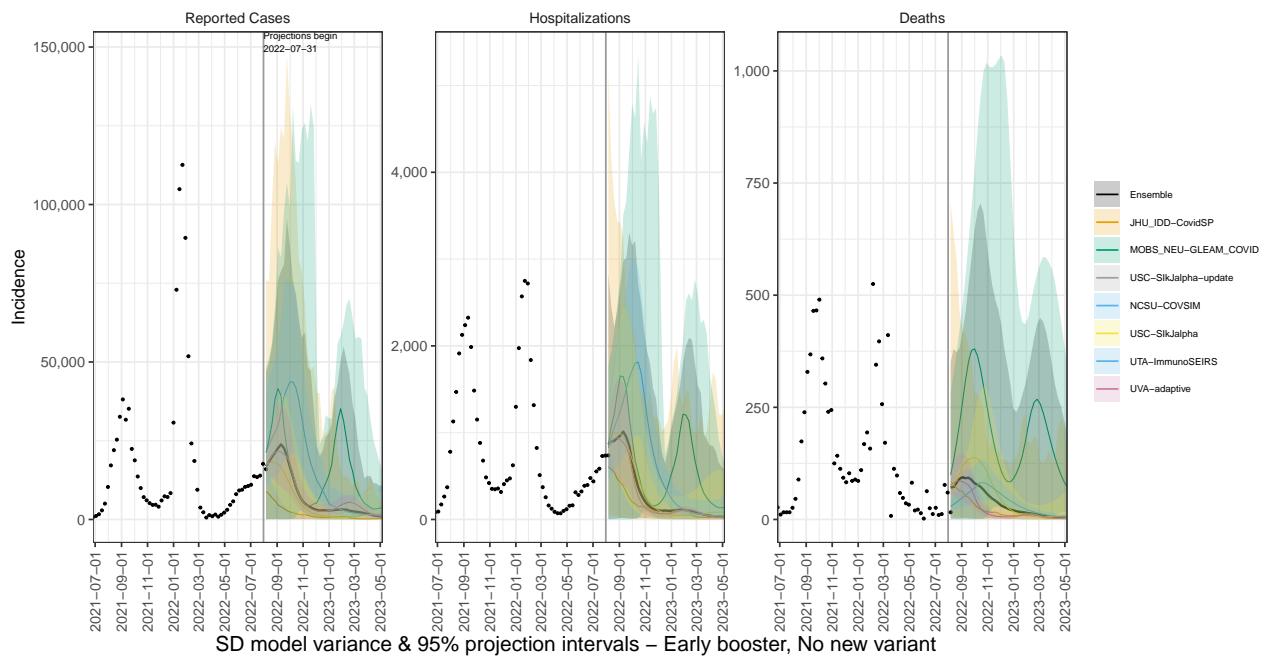
PA model variance & 95% projection intervals – Early booster, No new variant



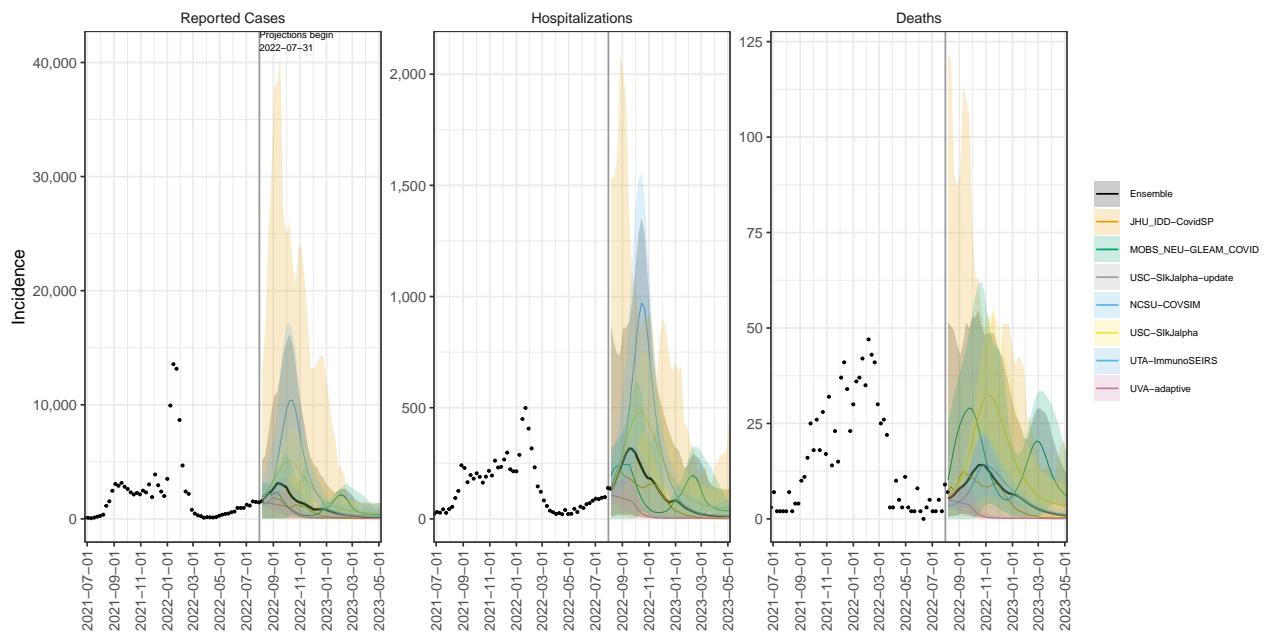
RI model variance & 95% projection intervals – Early booster, No new variant



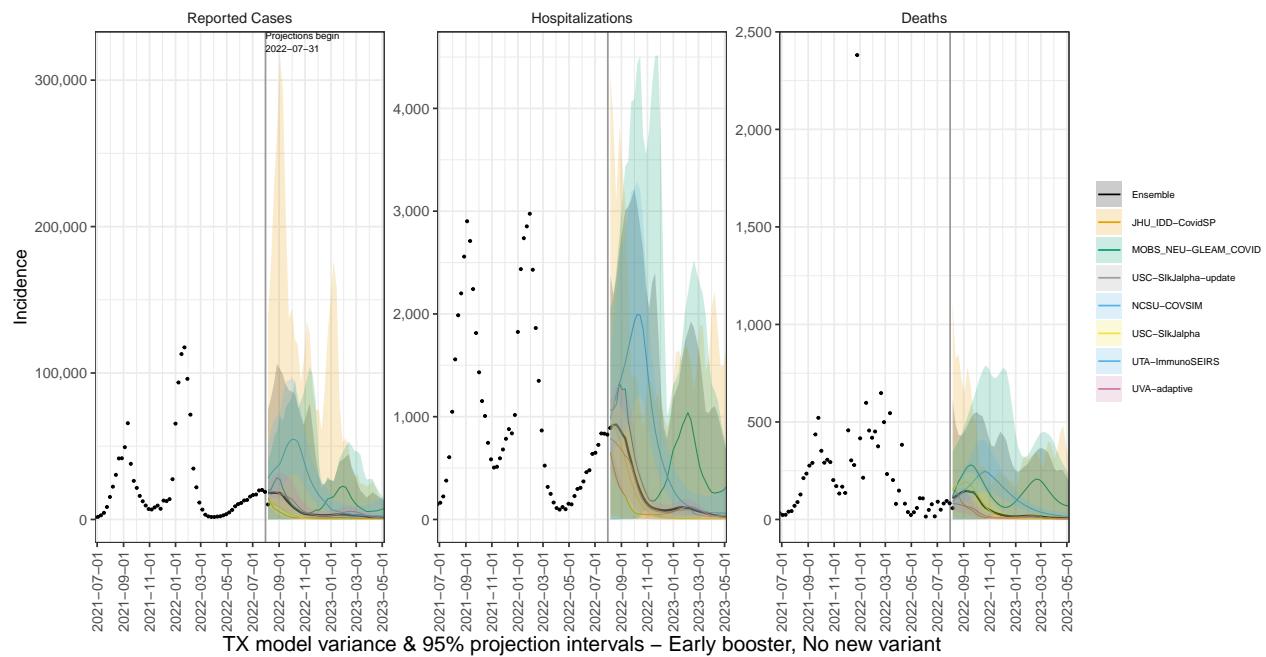
SC model variance & 95% projection intervals – Early booster, No new variant



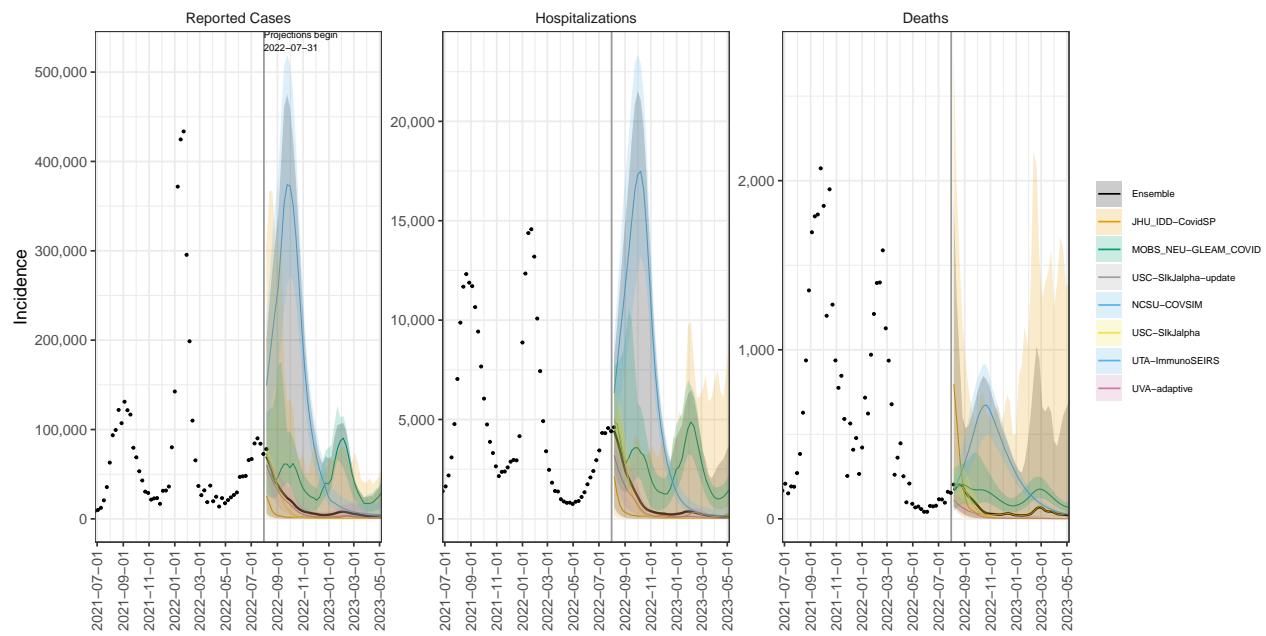
SD model variance & 95% projection intervals – Early booster, No new variant



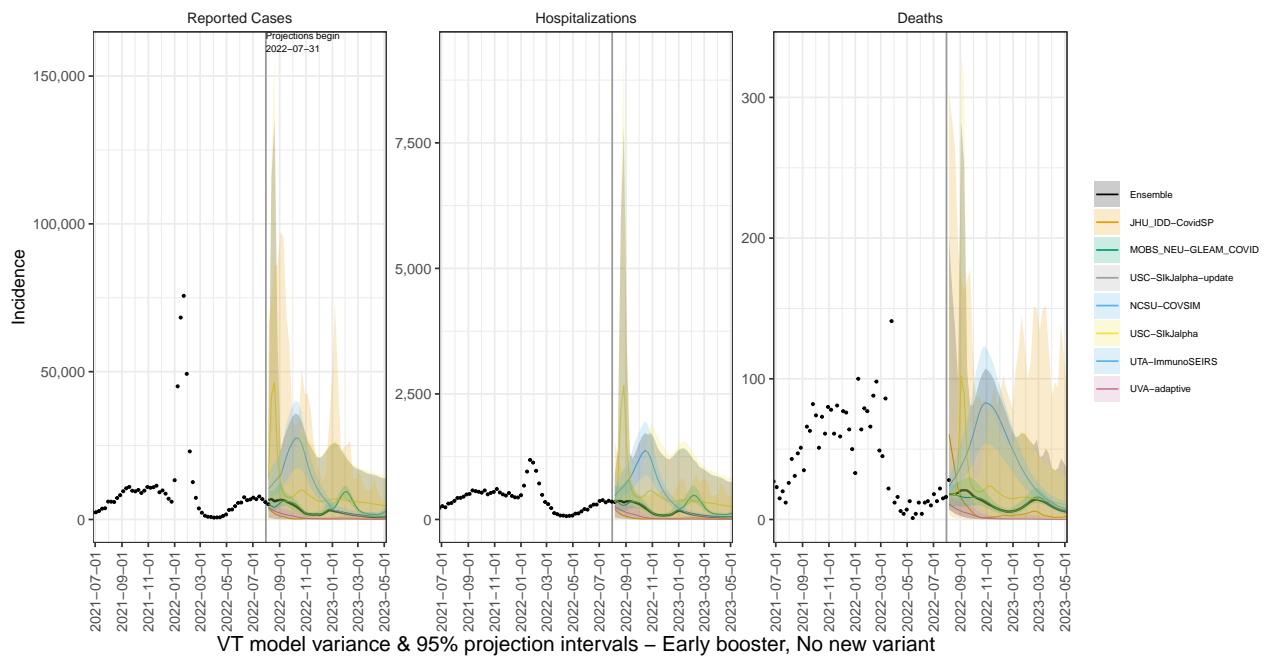
TN model variance & 95% projection intervals – Early booster, No new variant



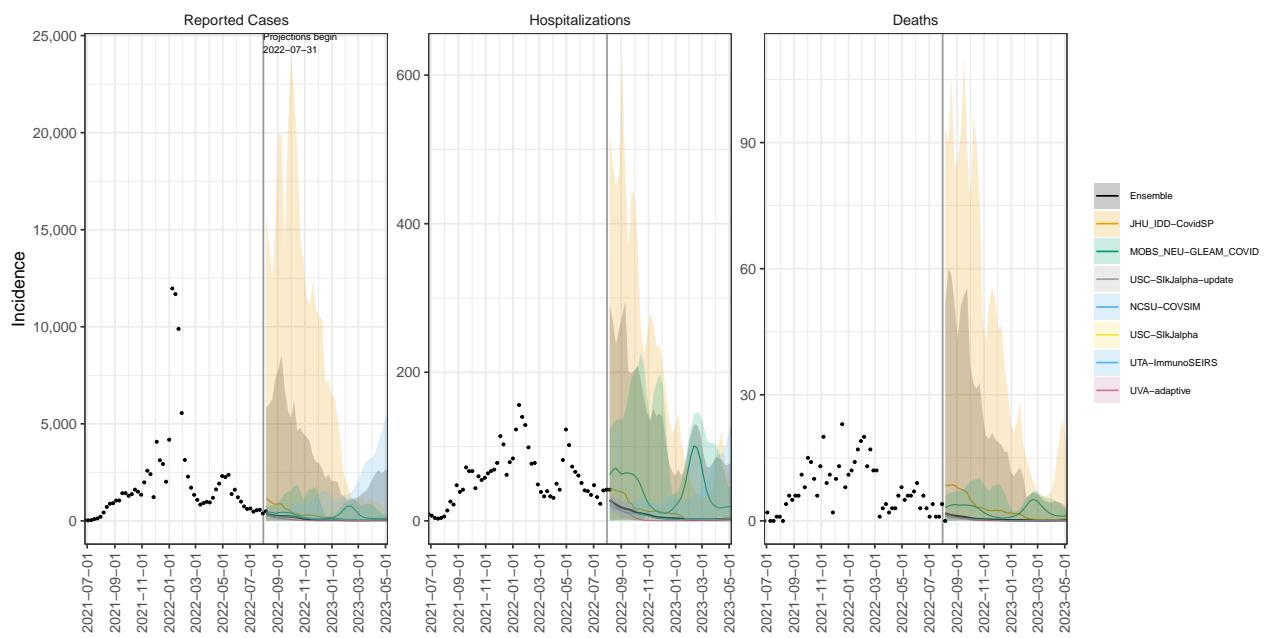
TX model variance & 95% projection intervals – Early booster, No new variant



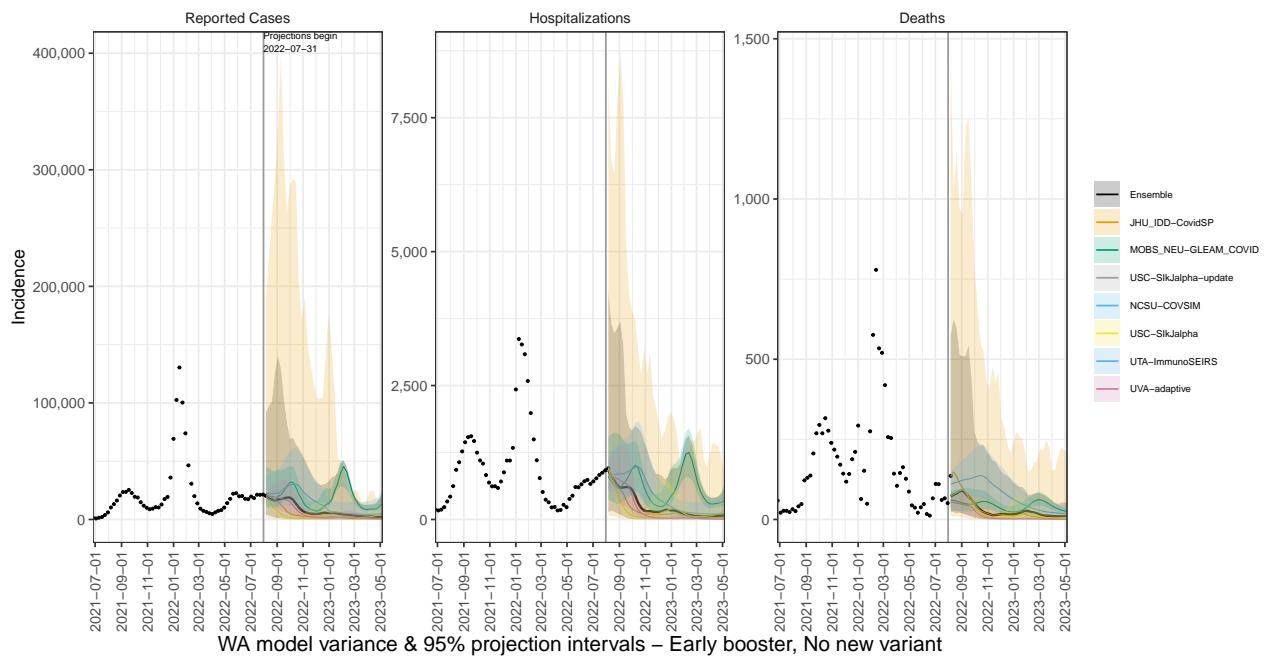
UT model variance & 95% projection intervals – Early booster, No new variant



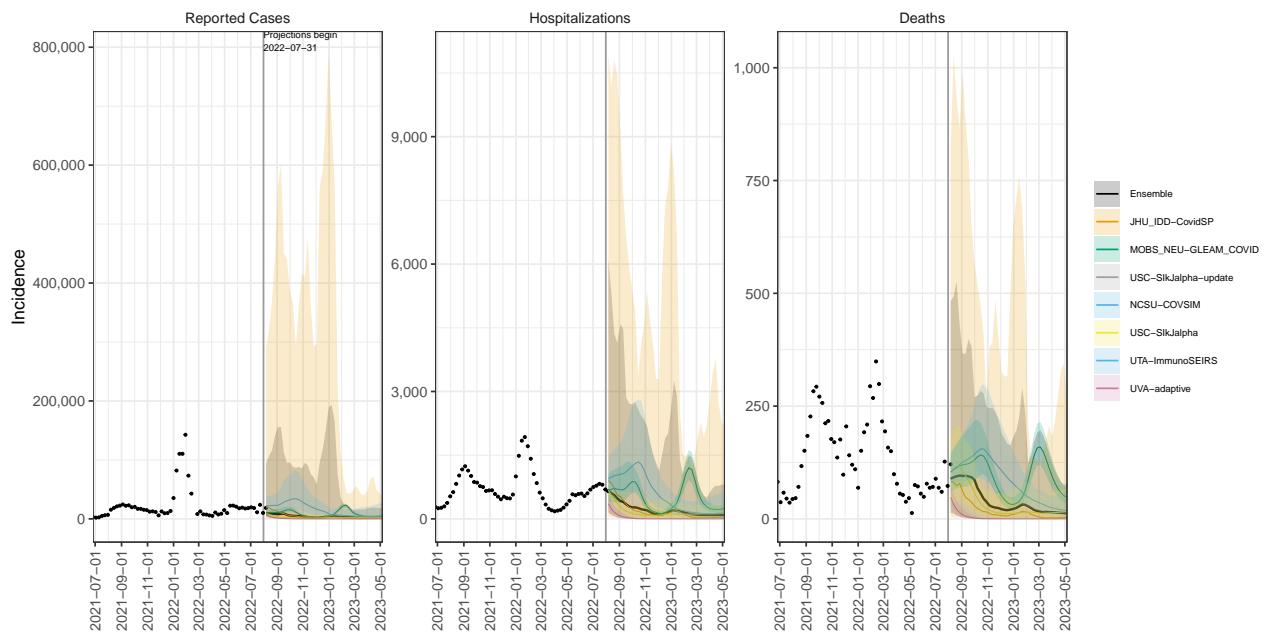
VT model variance & 95% projection intervals – Early booster, No new variant



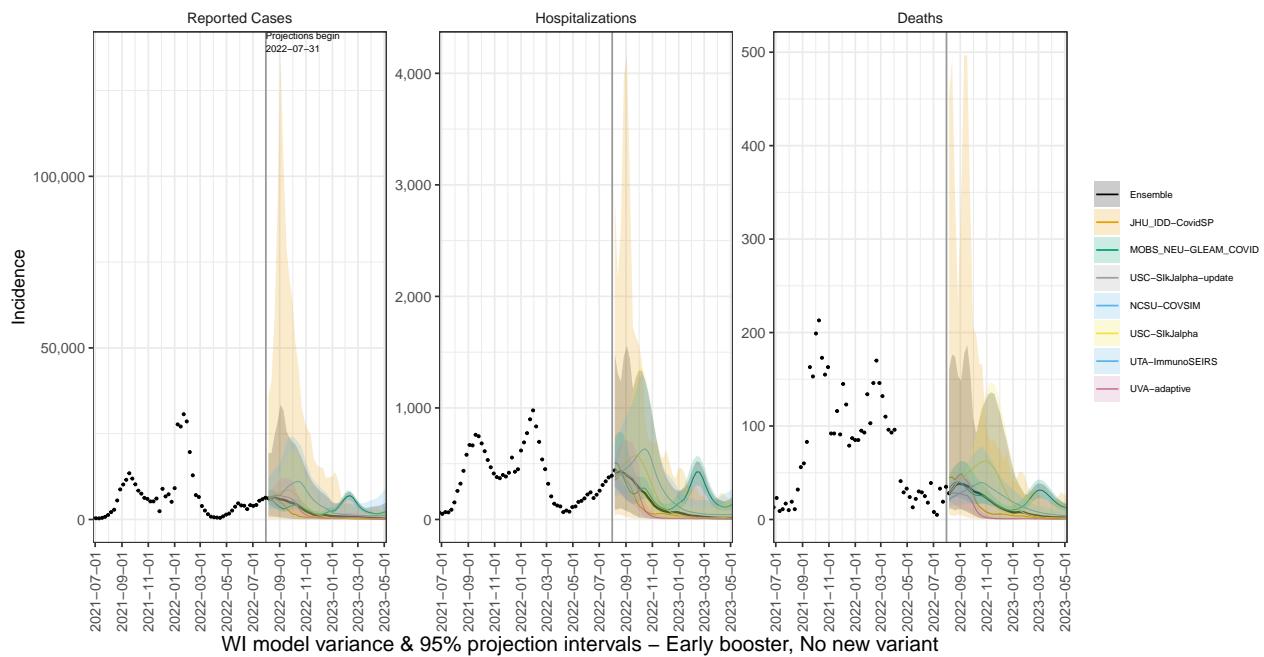
VA model variance & 95% projection intervals – Early booster, No new variant



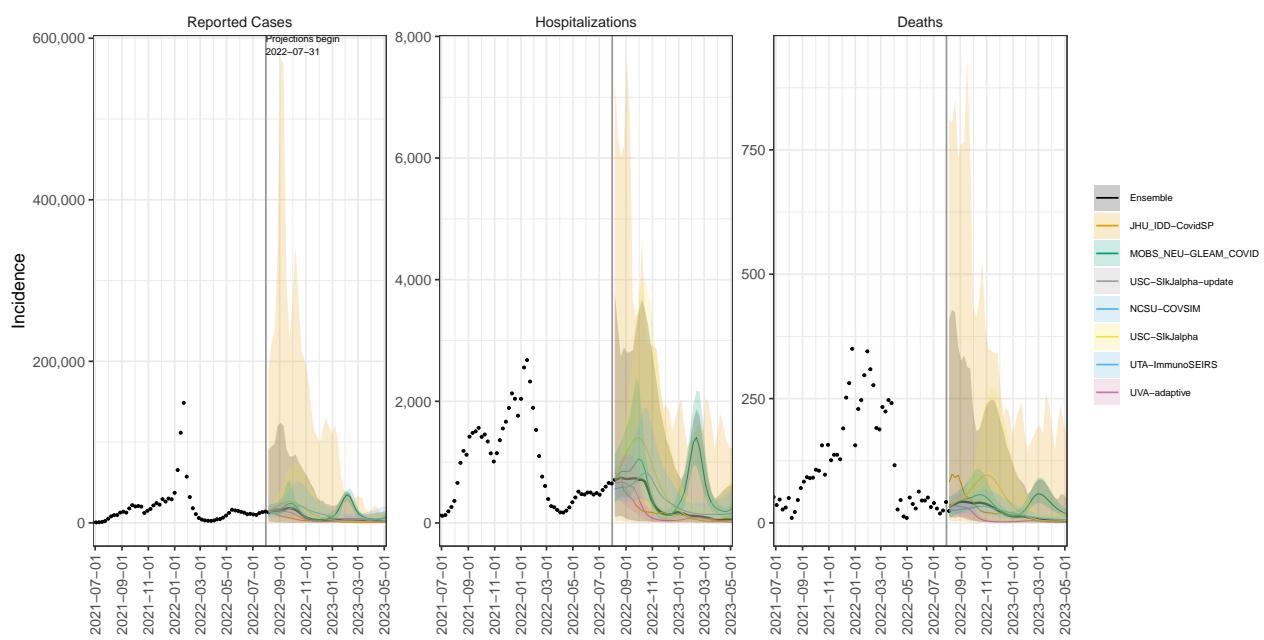
WA model variance & 95% projection intervals – Early booster, No new variant



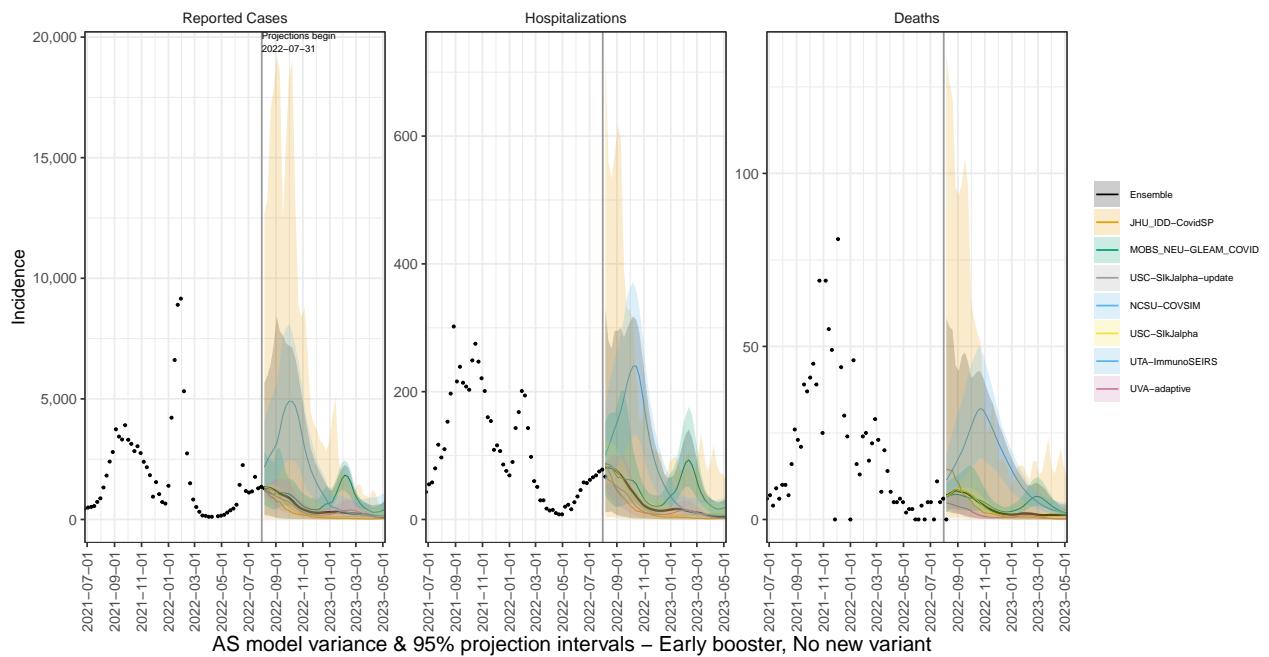
WV model variance & 95% projection intervals – Early booster, No new variant



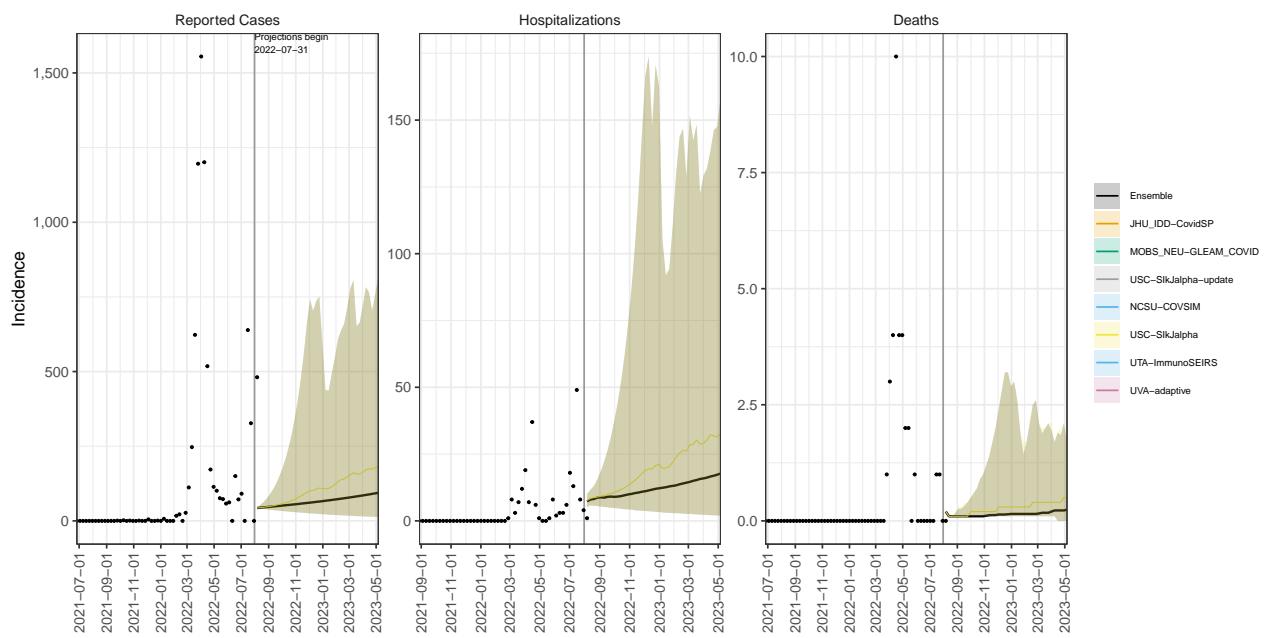
WI model variance & 95% projection intervals – Early booster, No new variant



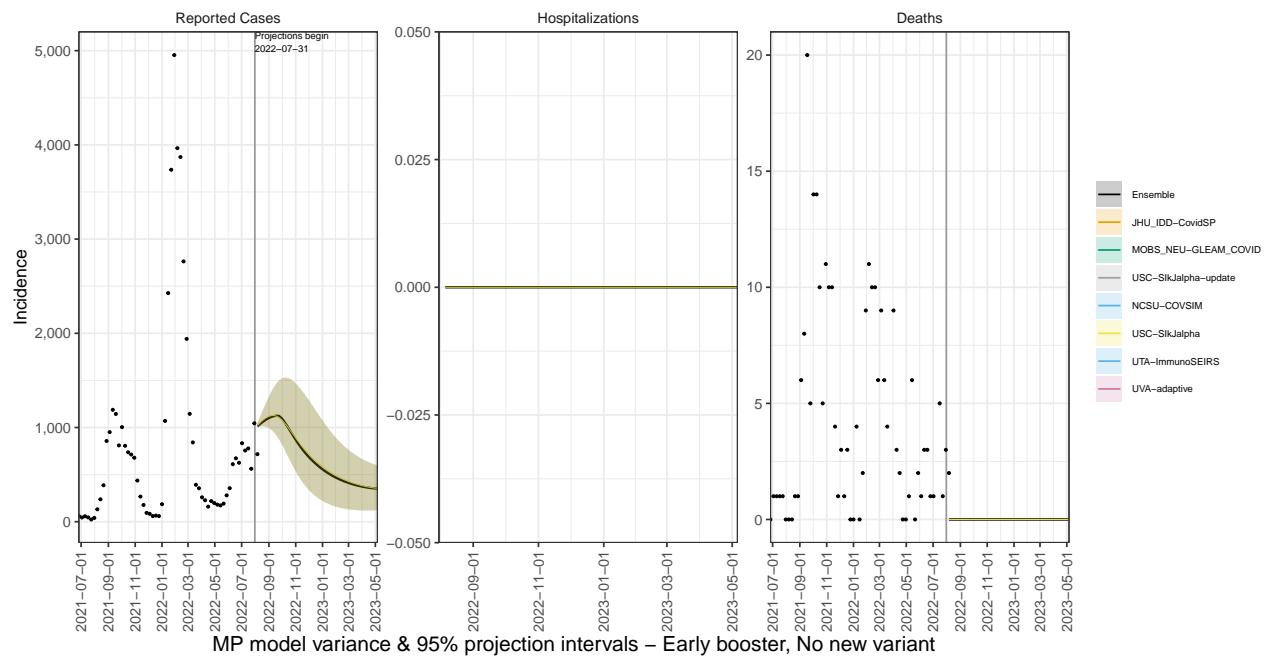
WY model variance & 95% projection intervals – Early booster, No new variant



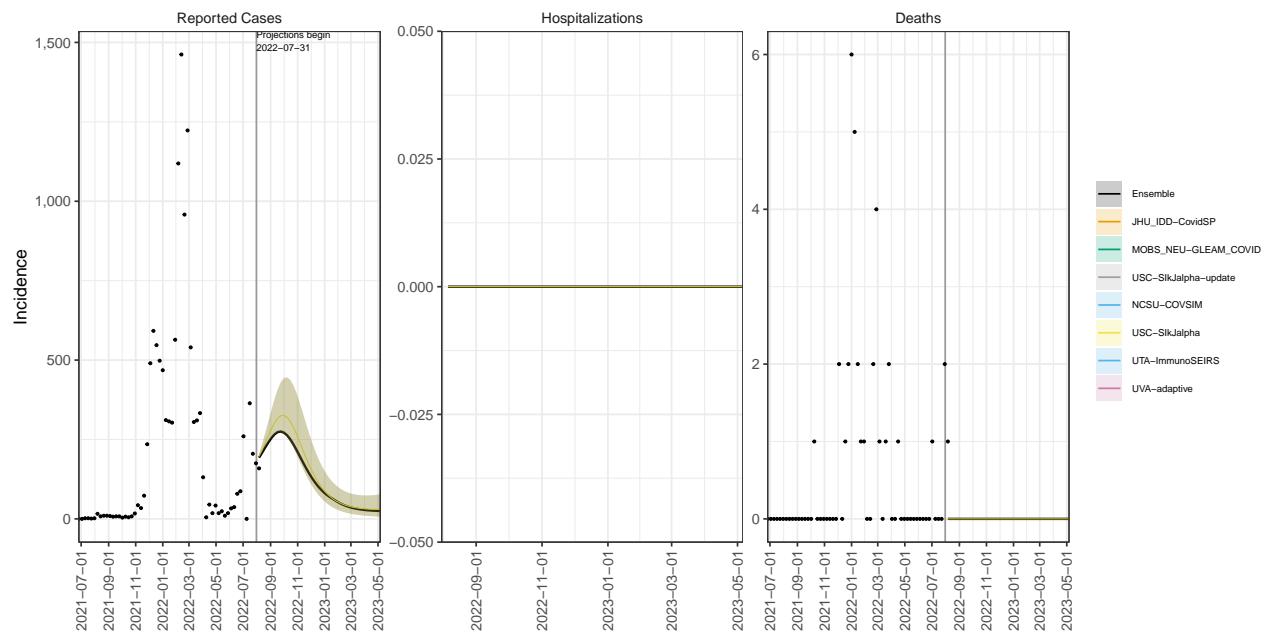
AS model variance & 95% projection intervals – Early booster, No new variant



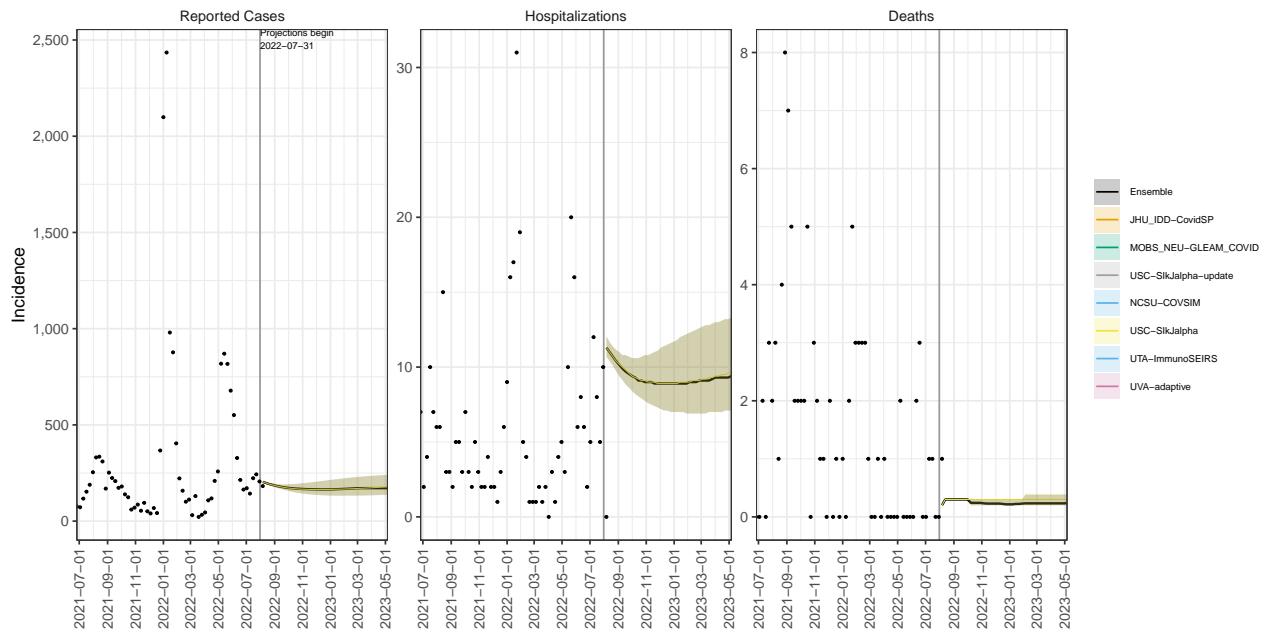
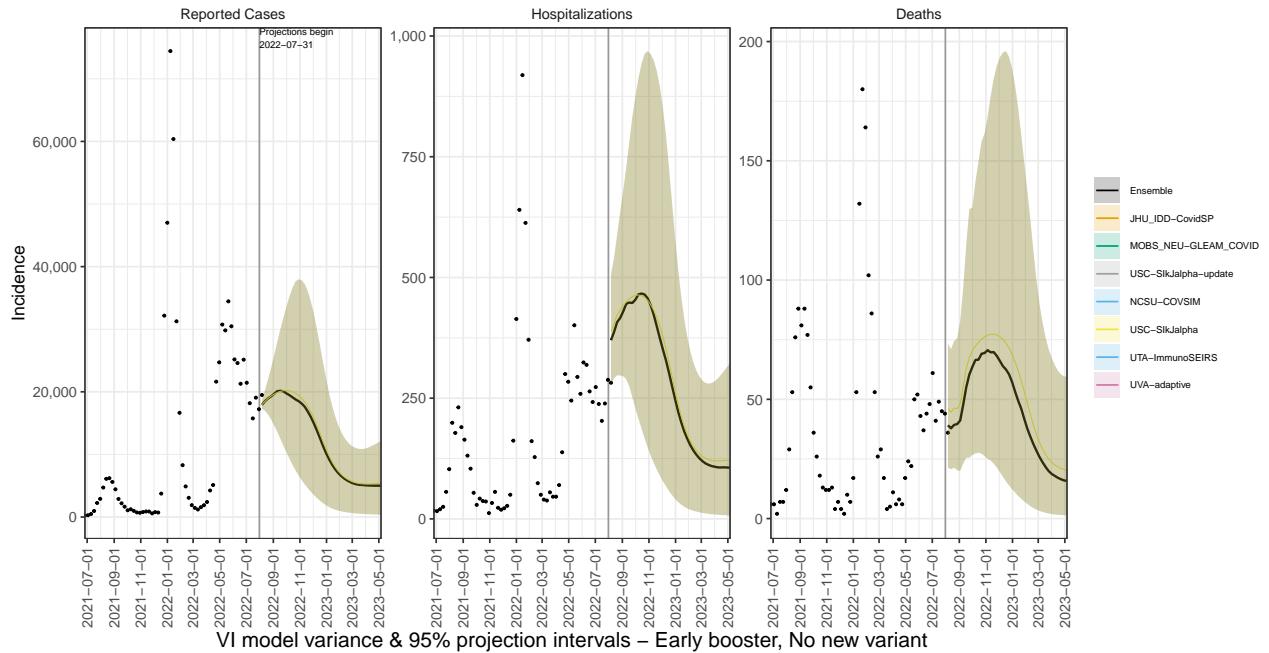
GU model variance & 95% projection intervals – Early booster, No new variant



MP model variance & 95% projection intervals – Early booster, No new variant

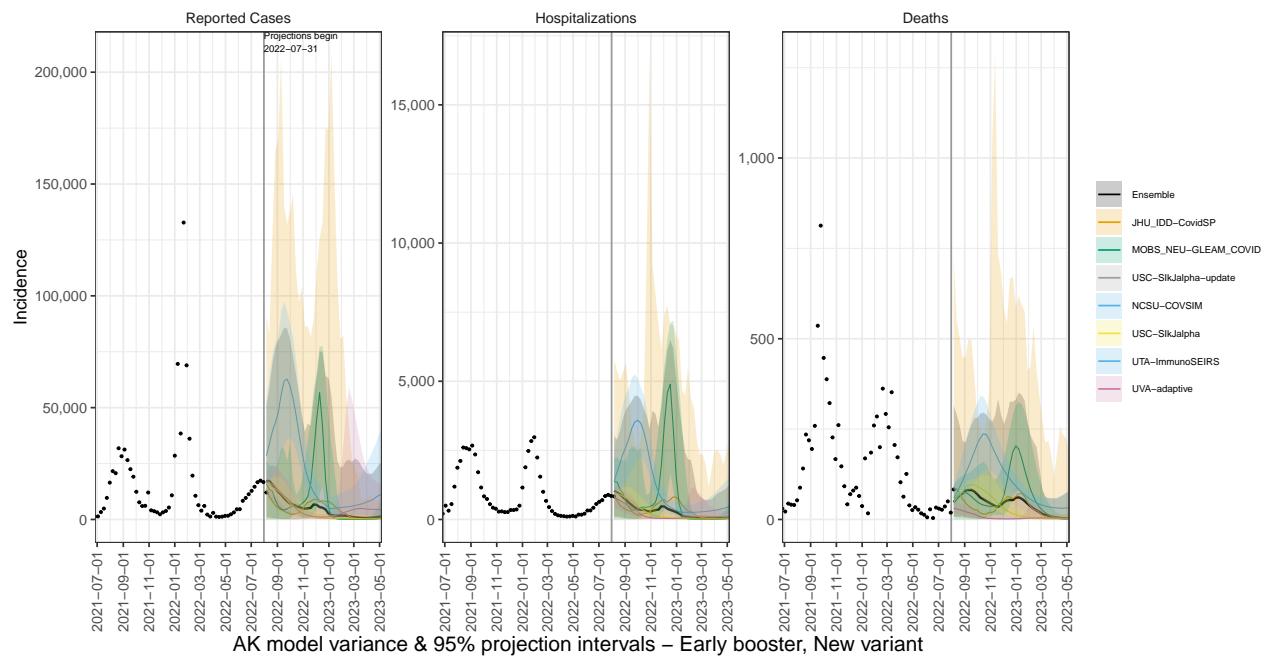


PR model variance & 95% projection intervals – Early booster, No new variant

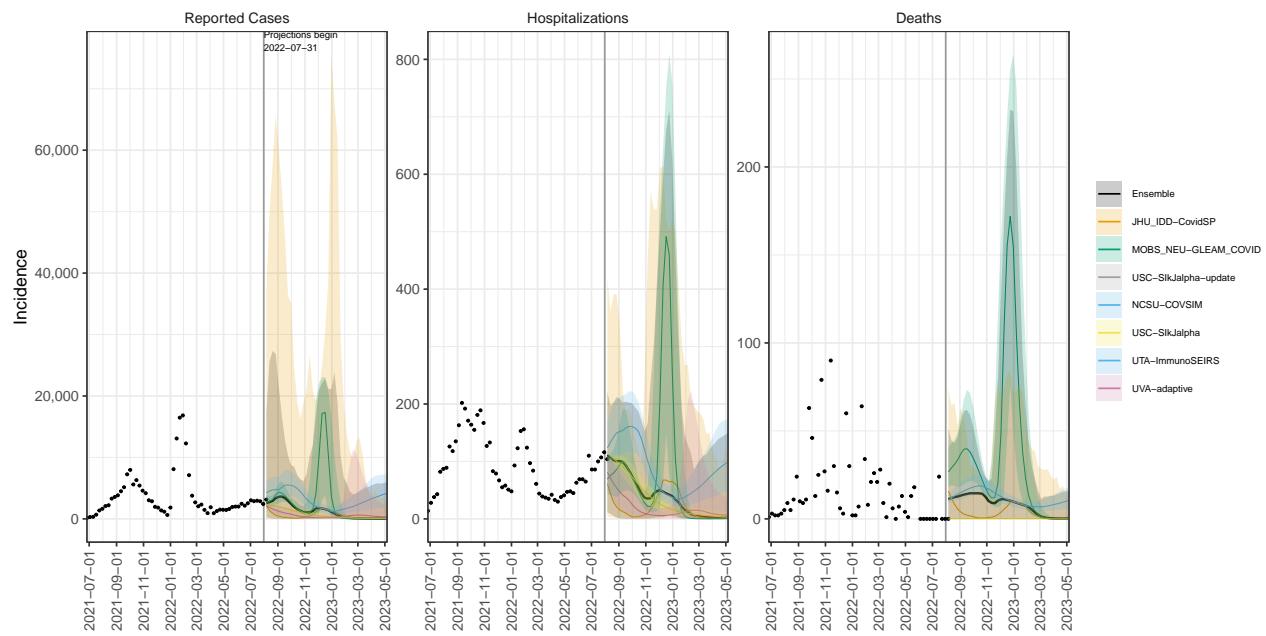


National model variation for Early booster, New variant scenario.

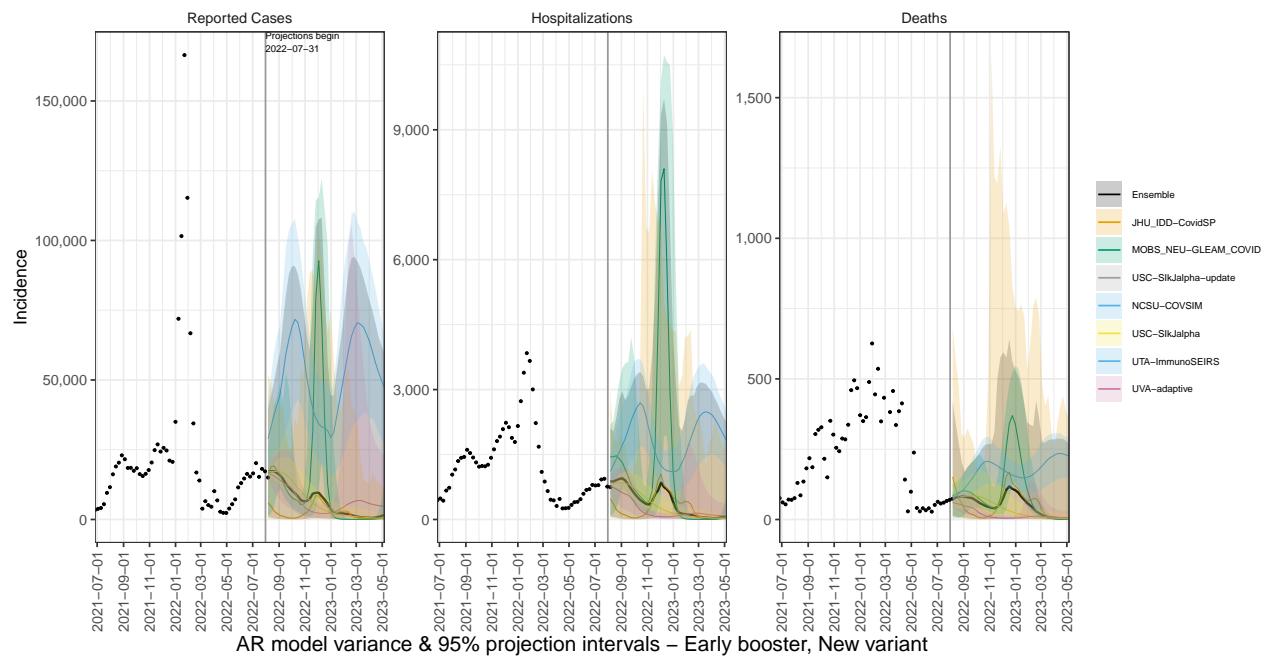
AL model variance & 95% projection intervals – Early booster, New variant



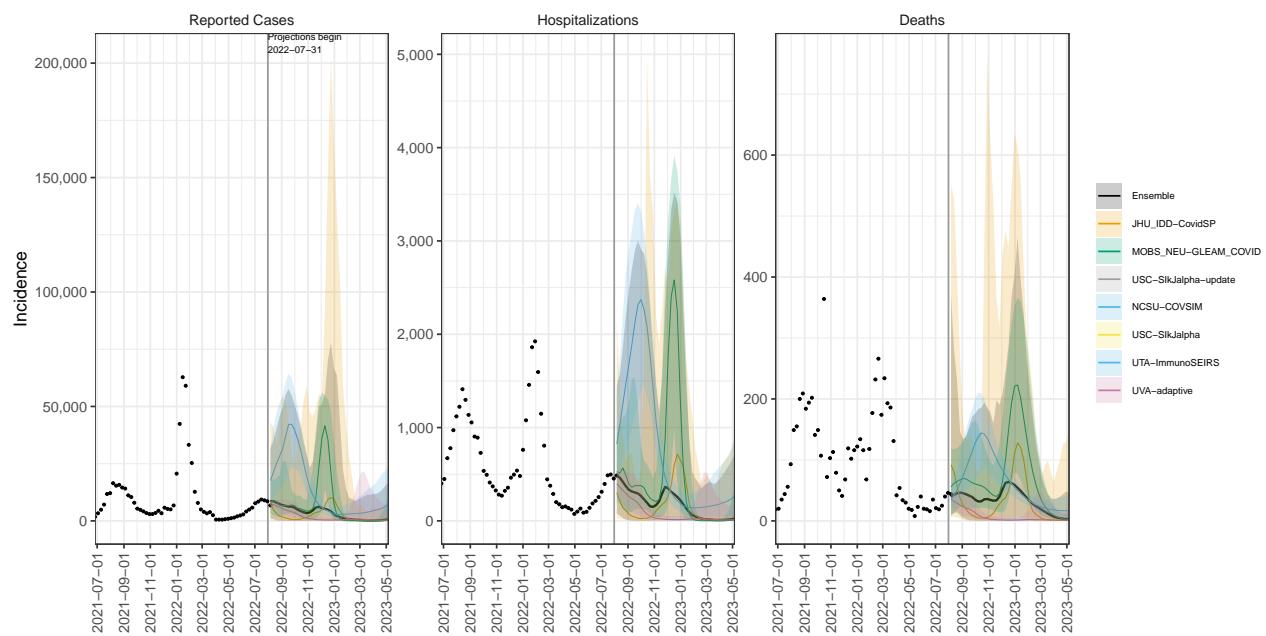
AK model variance & 95% projection intervals – Early booster, New variant



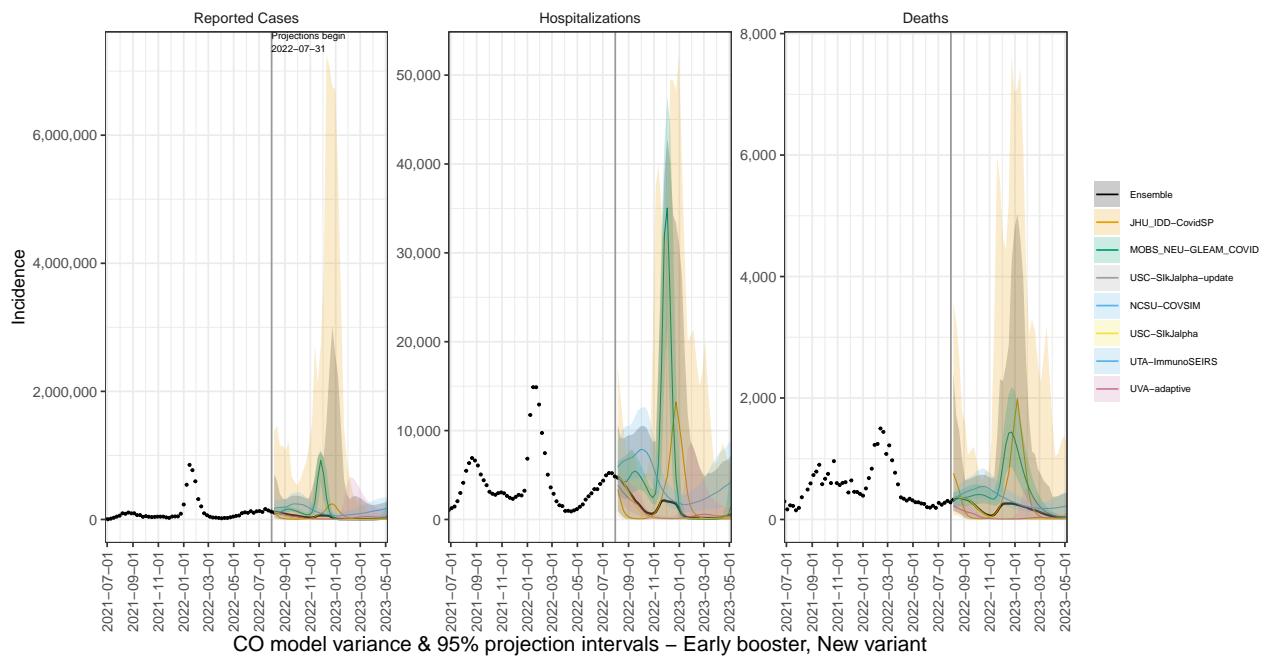
AZ model variance & 95% projection intervals – Early booster, New variant



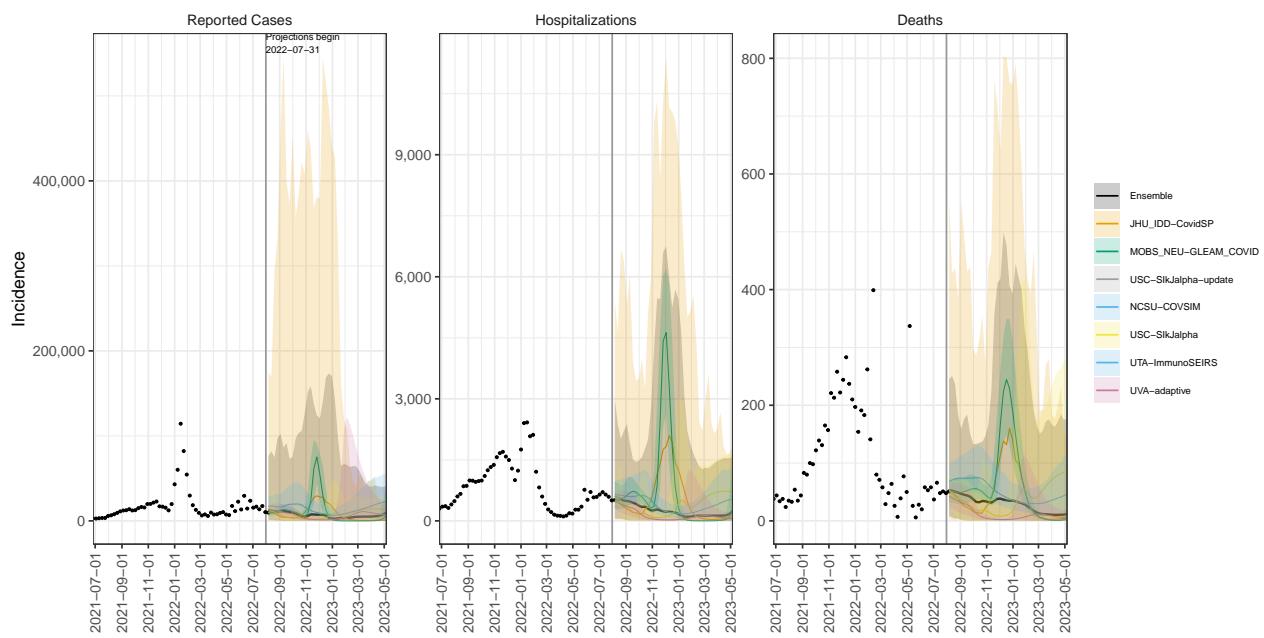
AR model variance & 95% projection intervals – Early booster, New variant



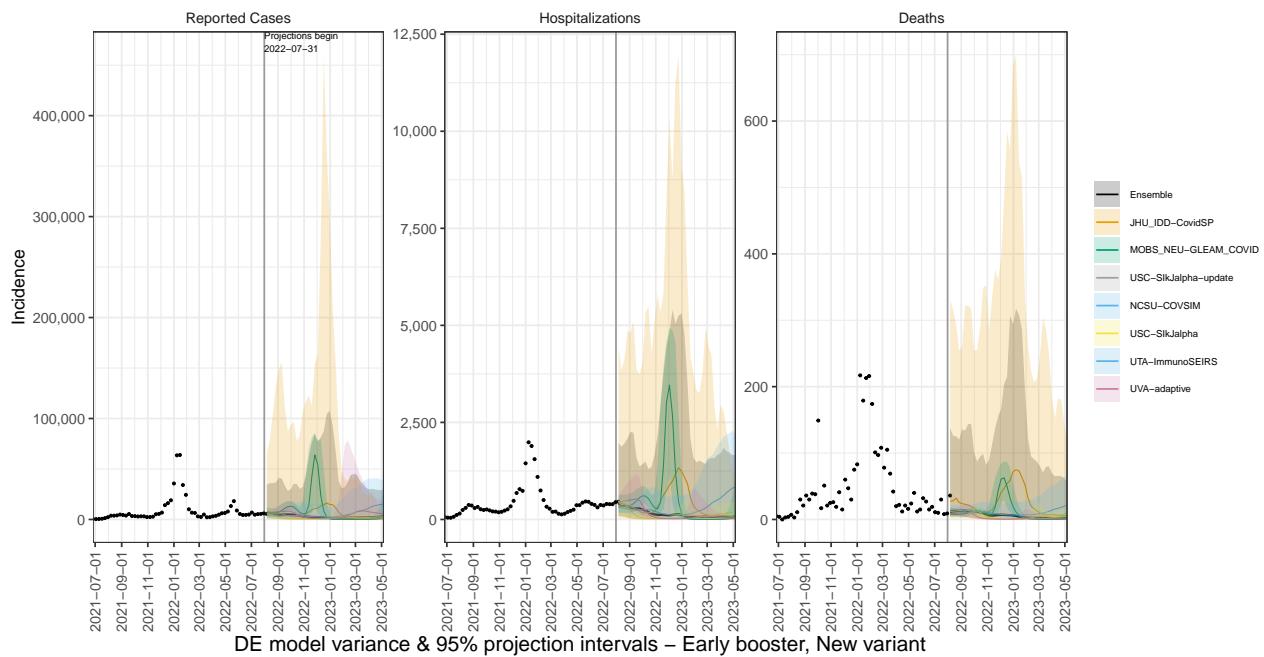
CA model variance & 95% projection intervals – Early booster, New variant



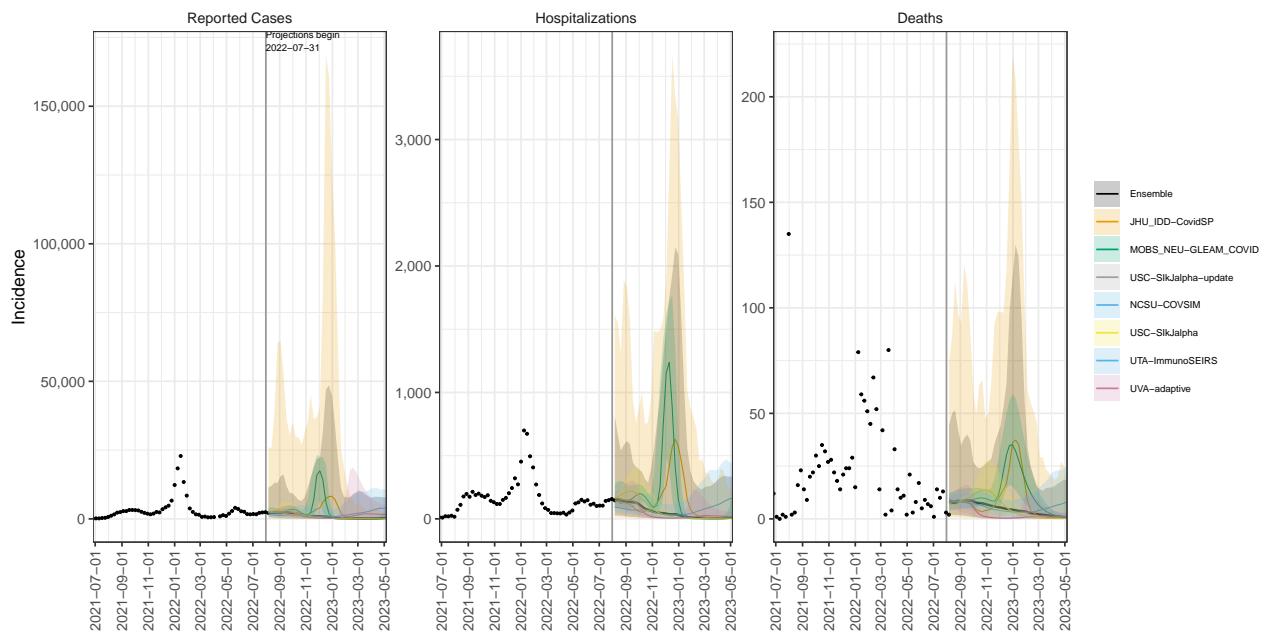
CO model variance & 95% projection intervals – Early booster, New variant



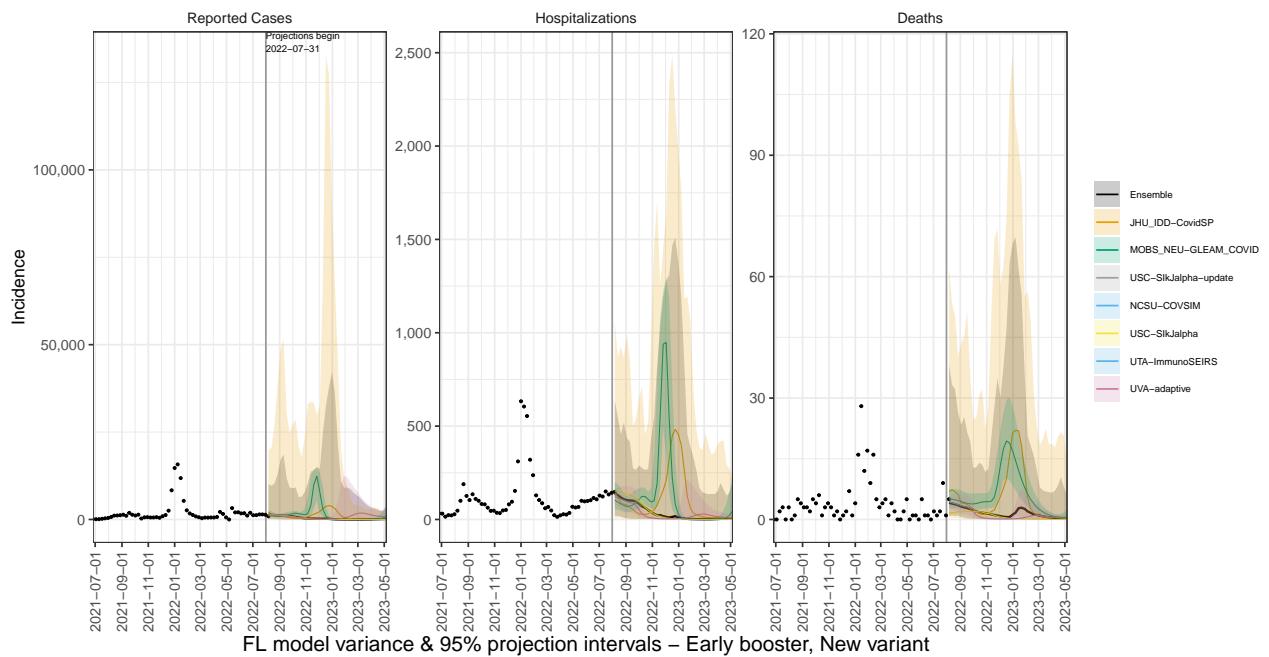
CT model variance & 95% projection intervals – Early booster, New variant



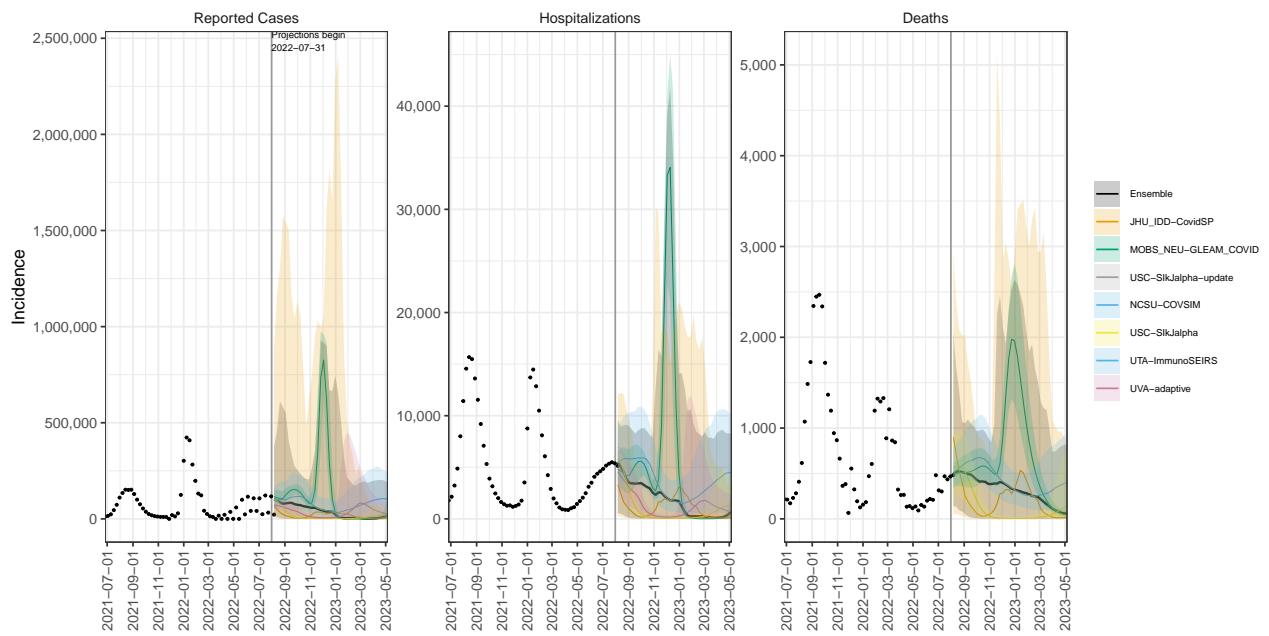
DE model variance & 95% projection intervals – Early booster, New variant



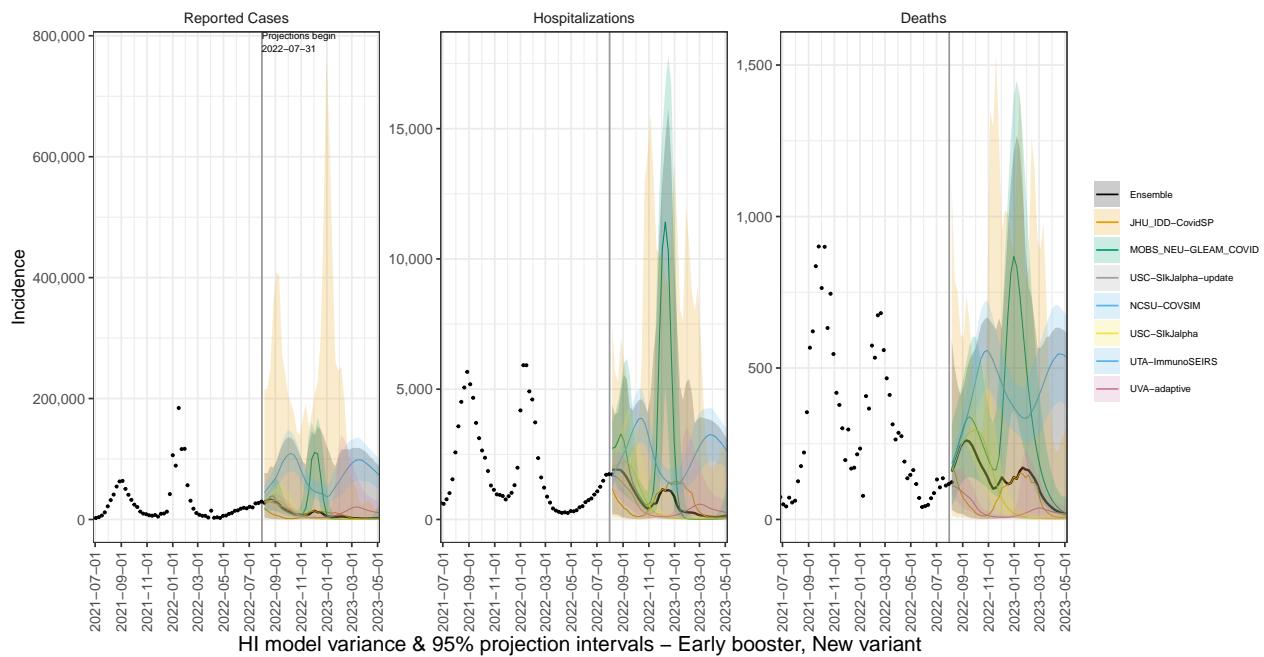
DC model variance & 95% projection intervals – Early booster, New variant



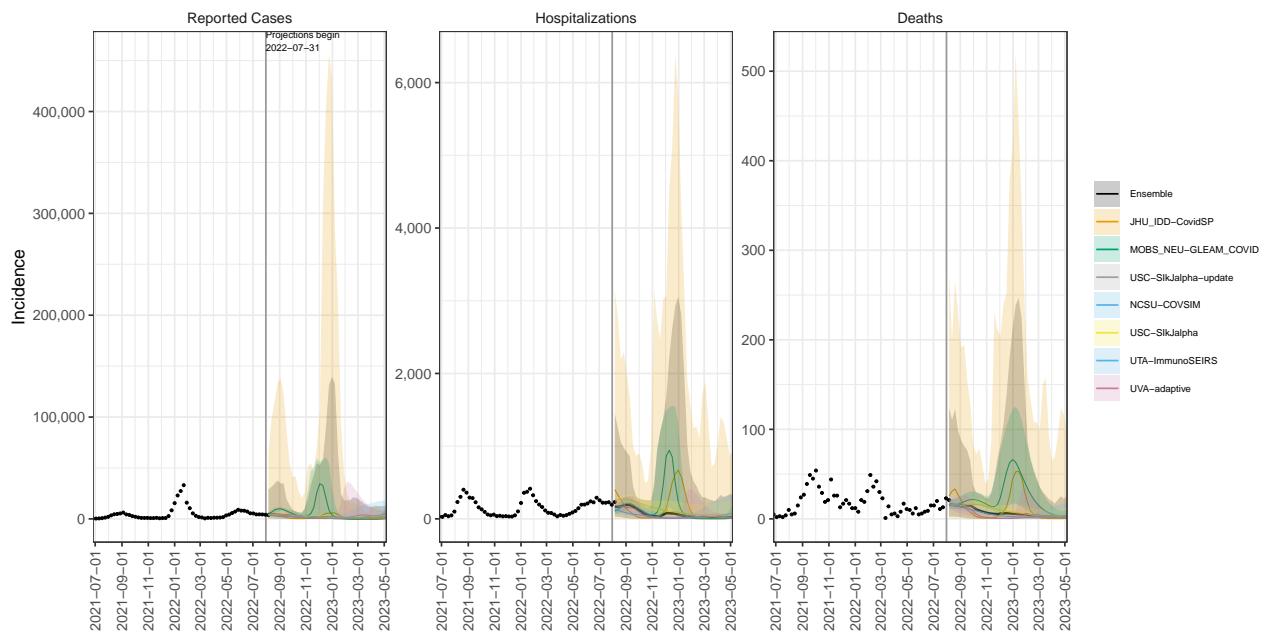
FL model variance & 95% projection intervals – Early booster, New variant



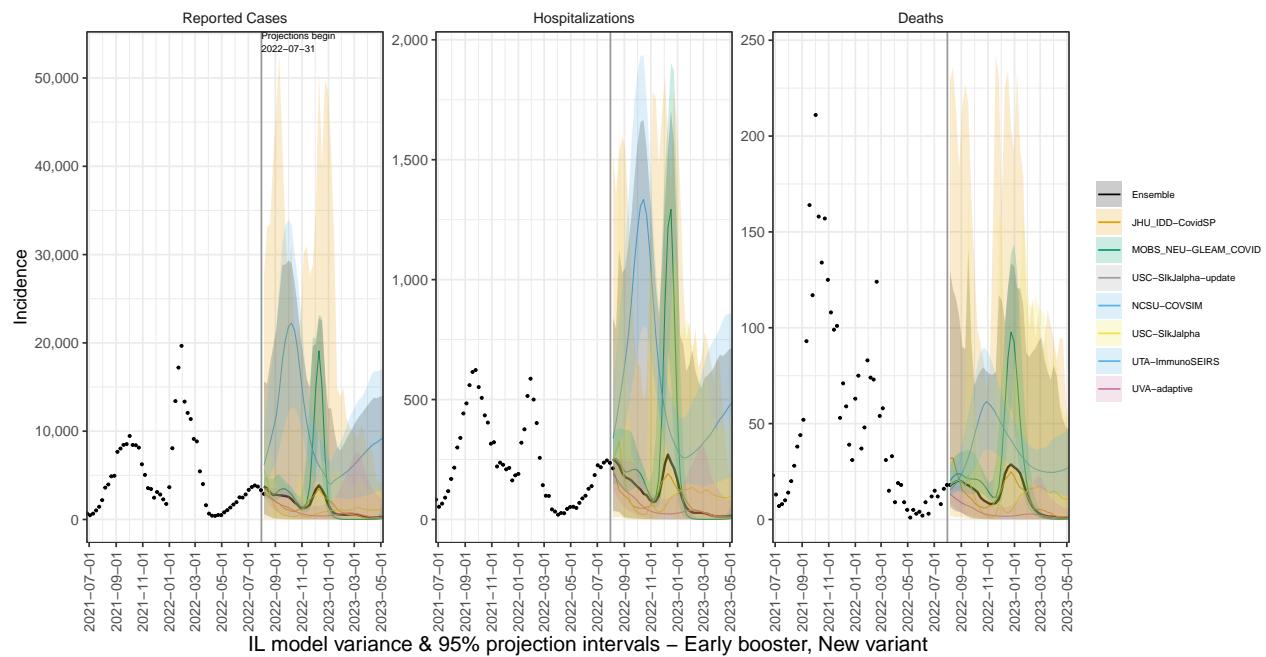
GA model variance & 95% projection intervals – Early booster, New variant



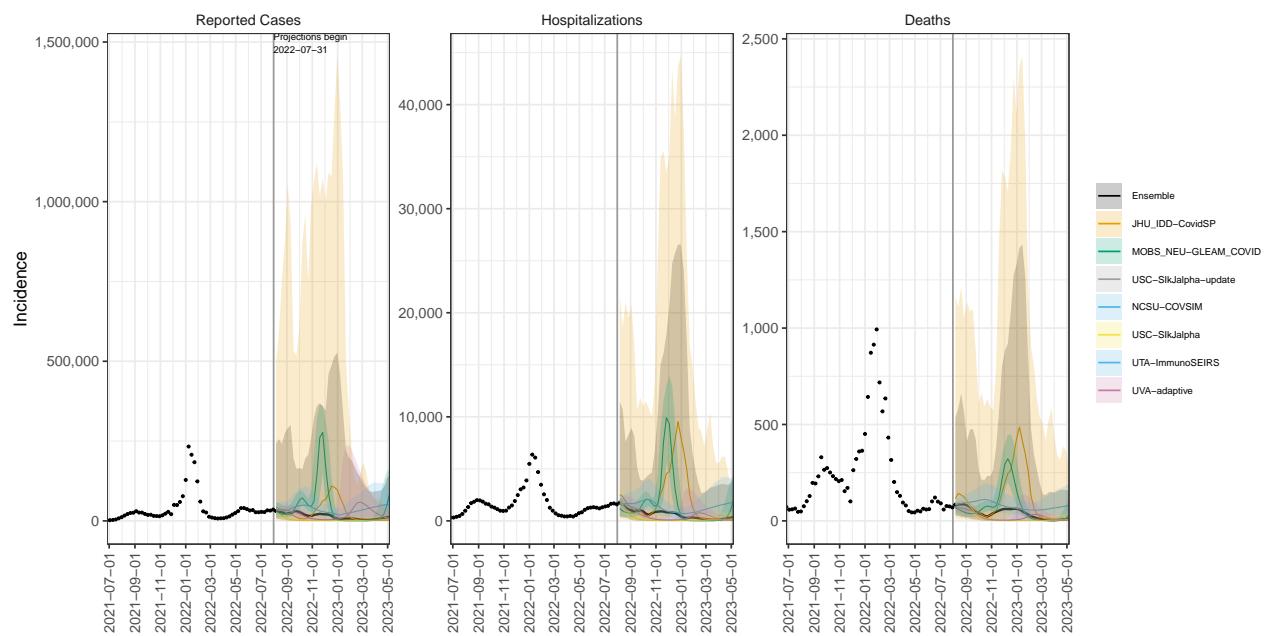
HI model variance & 95% projection intervals – Early booster, New variant



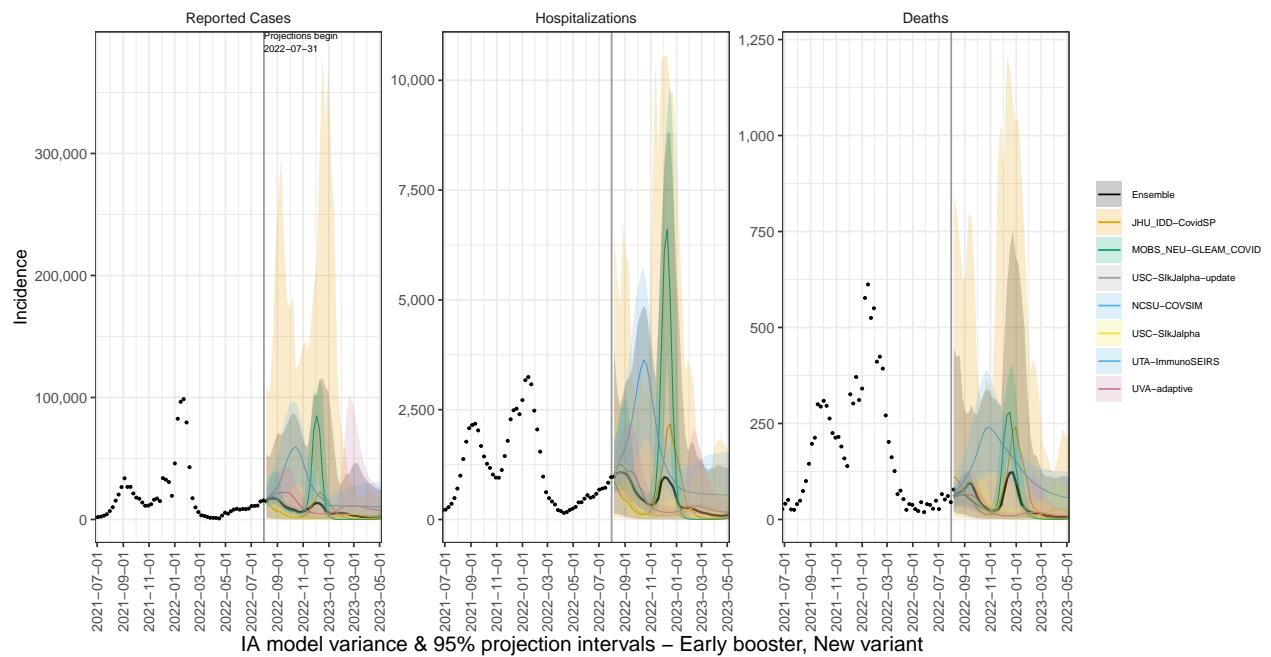
ID model variance & 95% projection intervals – Early booster, New variant



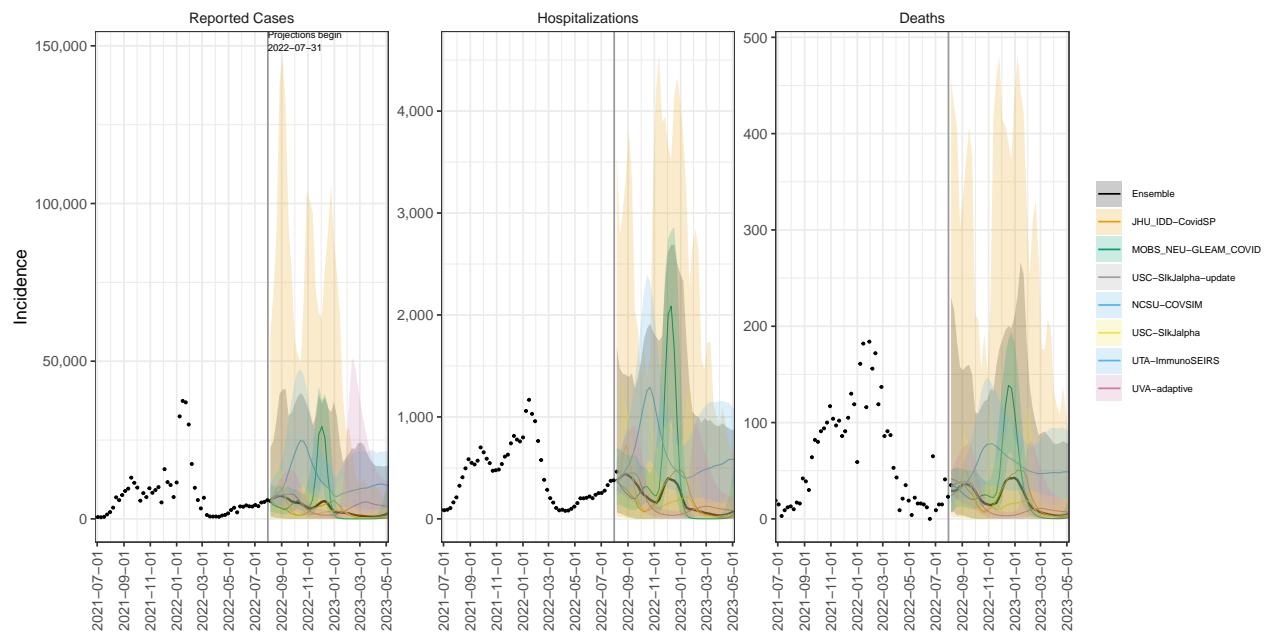
IL model variance & 95% projection intervals – Early booster, New variant



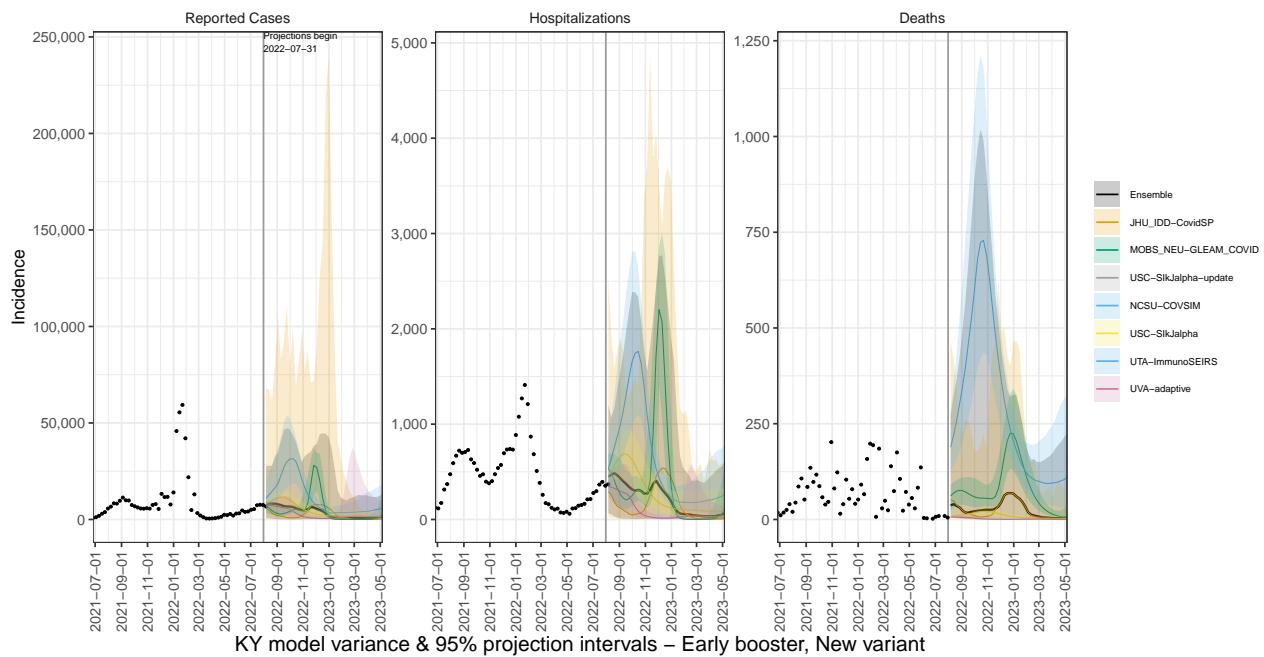
IN model variance & 95% projection intervals – Early booster, New variant



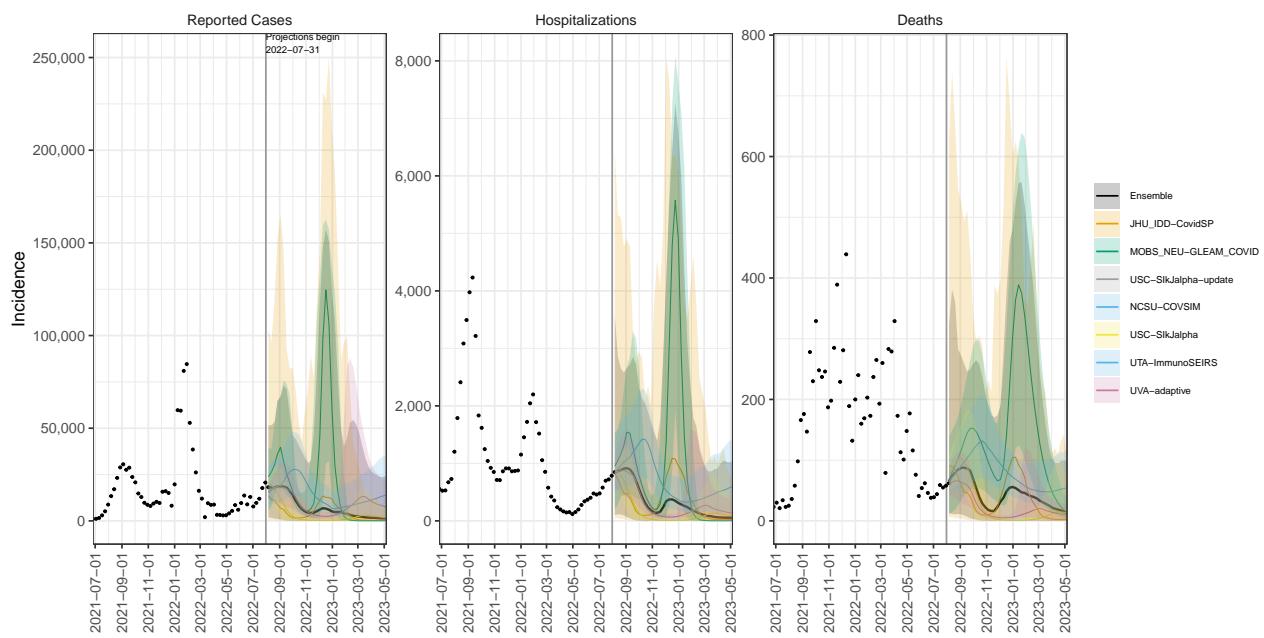
IA model variance & 95% projection intervals – Early booster, New variant



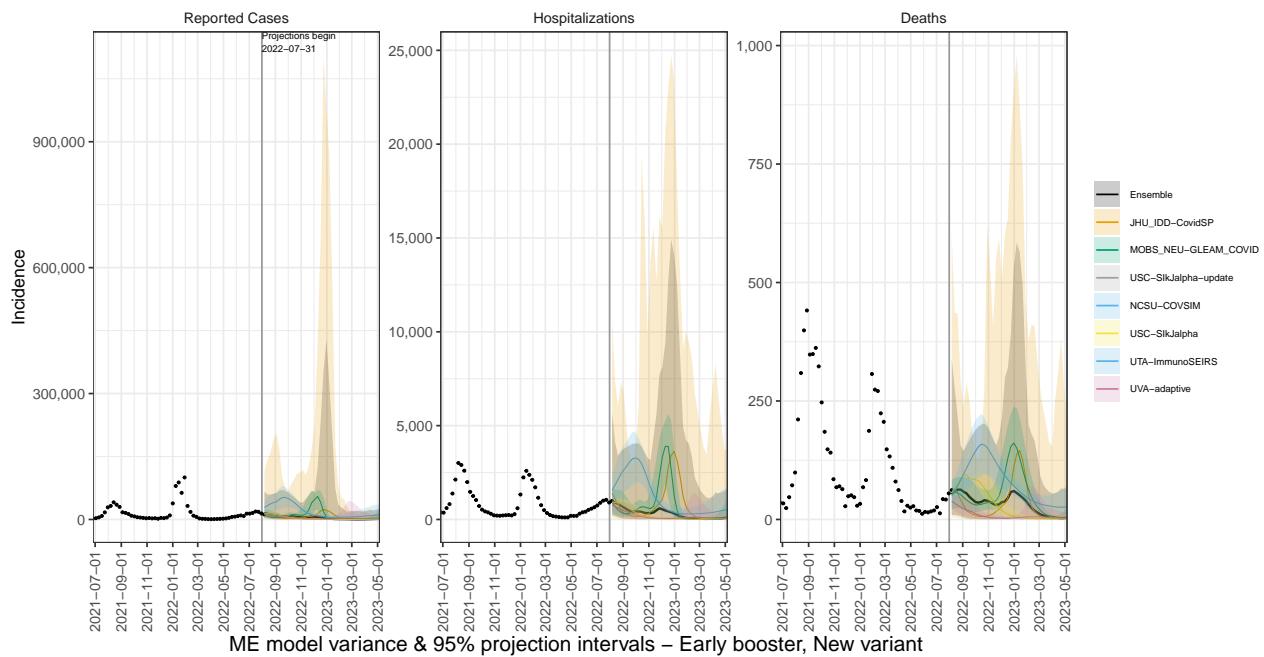
KS model variance & 95% projection intervals – Early booster, New variant



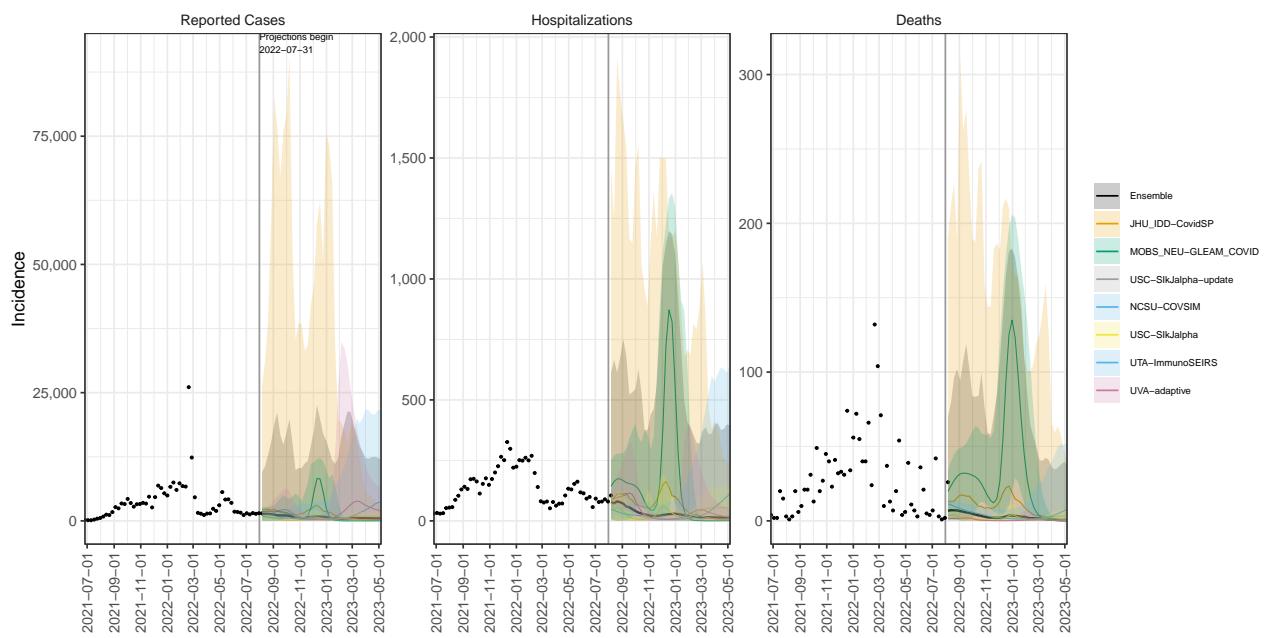
KY model variance & 95% projection intervals – Early booster, New variant



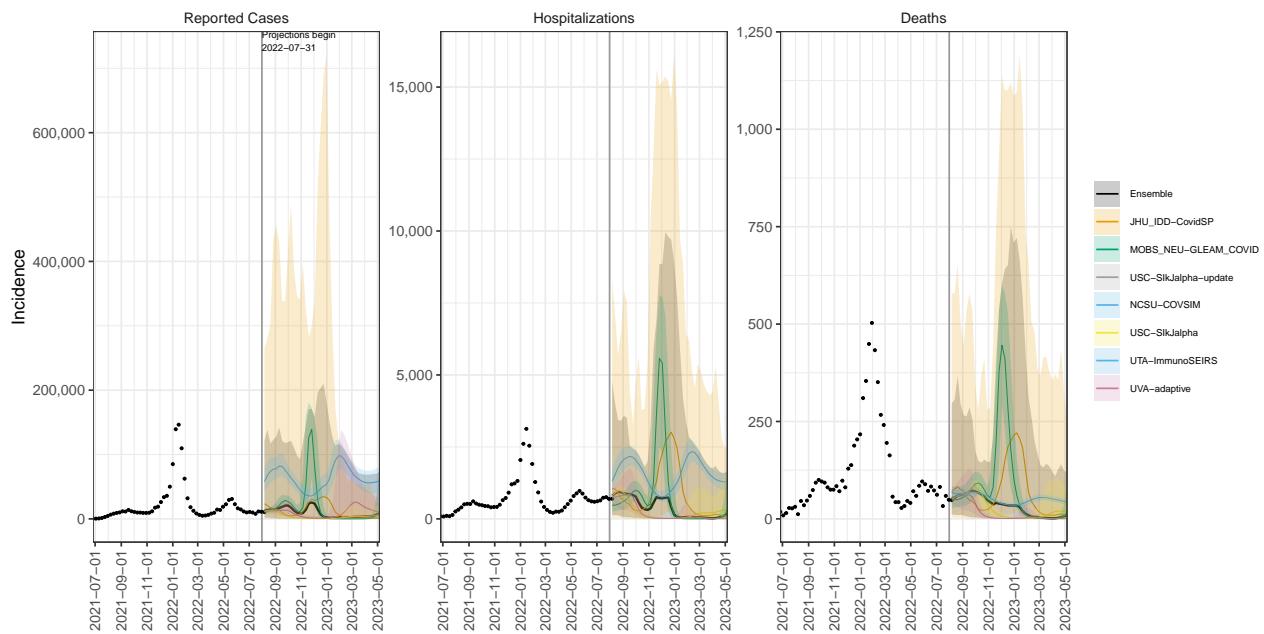
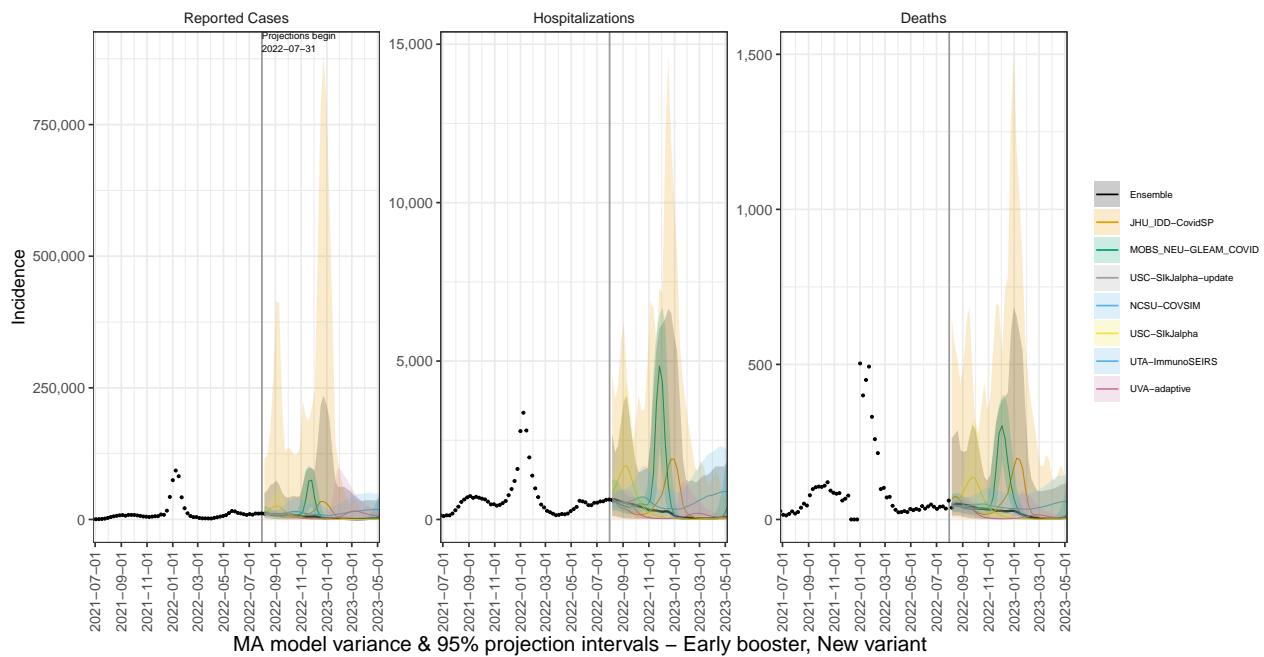
LA model variance & 95% projection intervals – Early booster, New variant



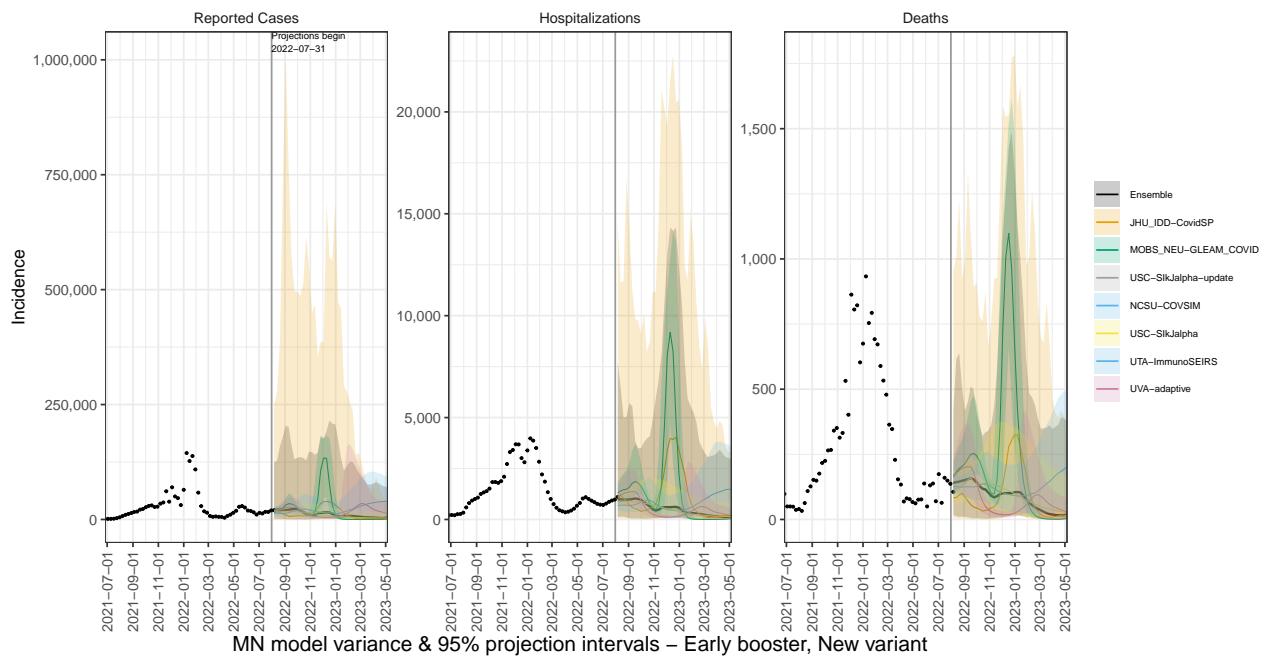
ME model variance & 95% projection intervals – Early booster, New variant



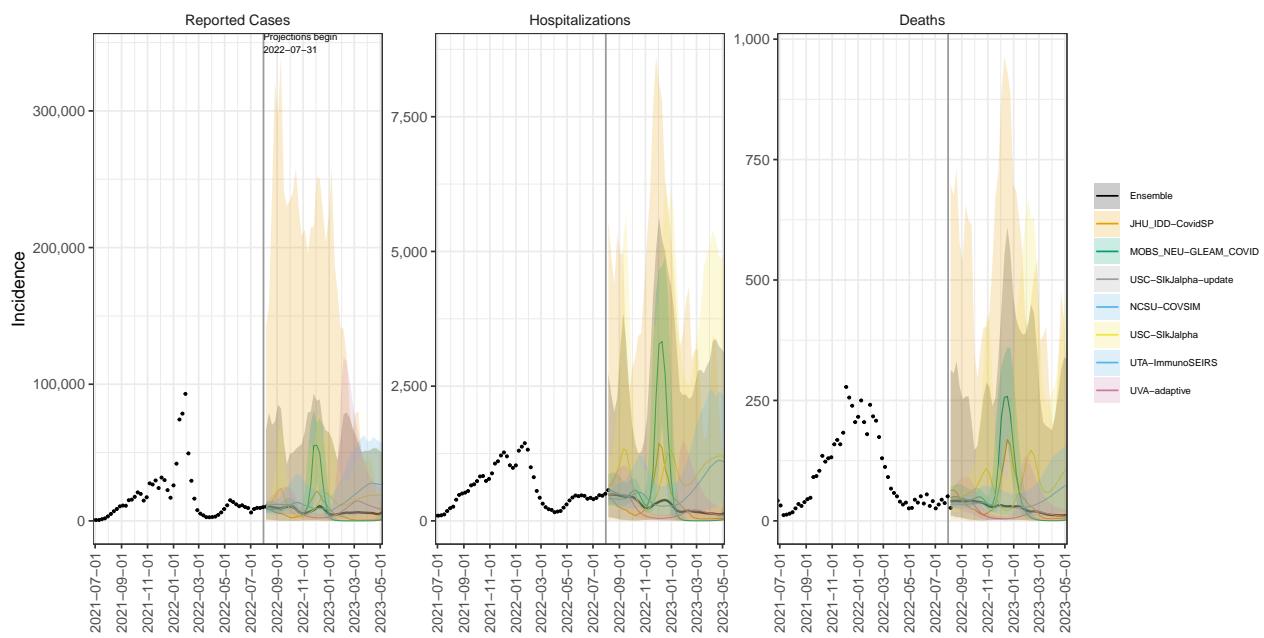
MD model variance & 95% projection intervals – Early booster, New variant



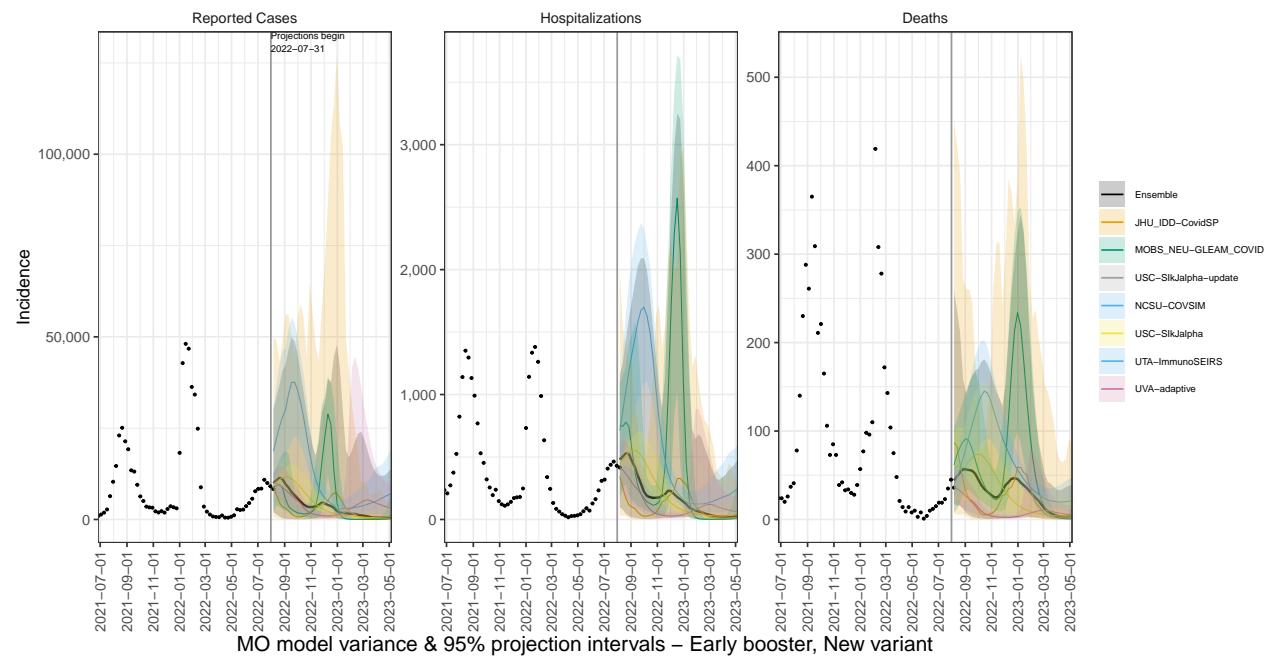
MI model variance & 95% projection intervals – Early booster, New variant



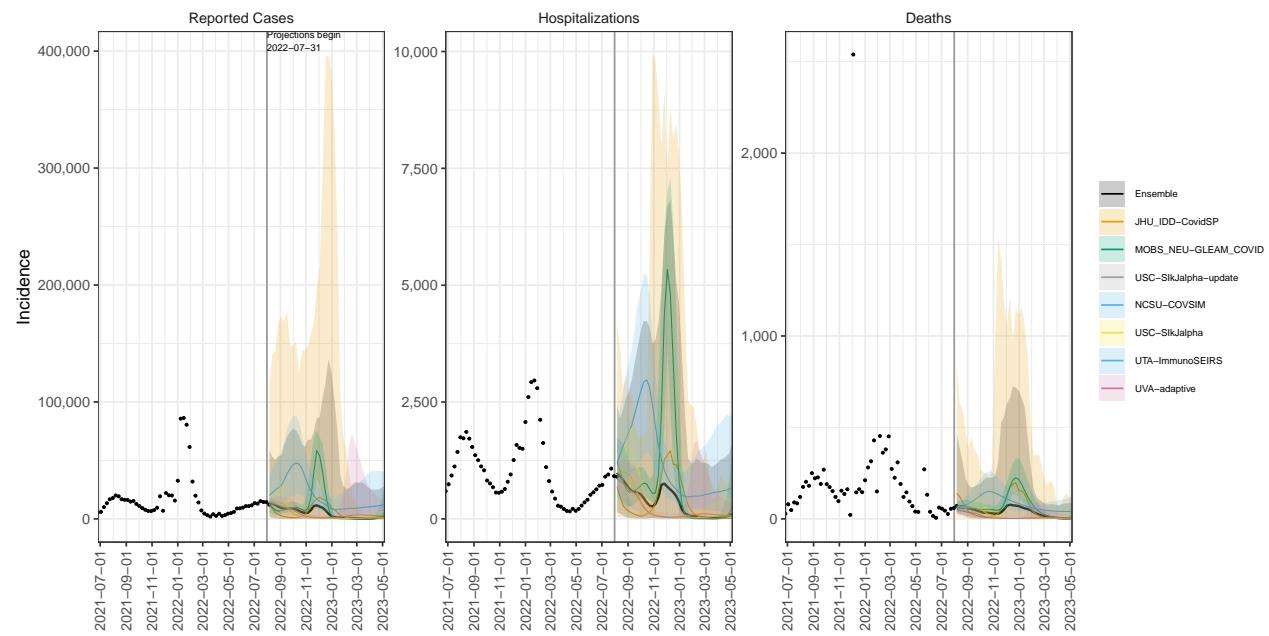
MN model variance & 95% projection intervals – Early booster, New variant



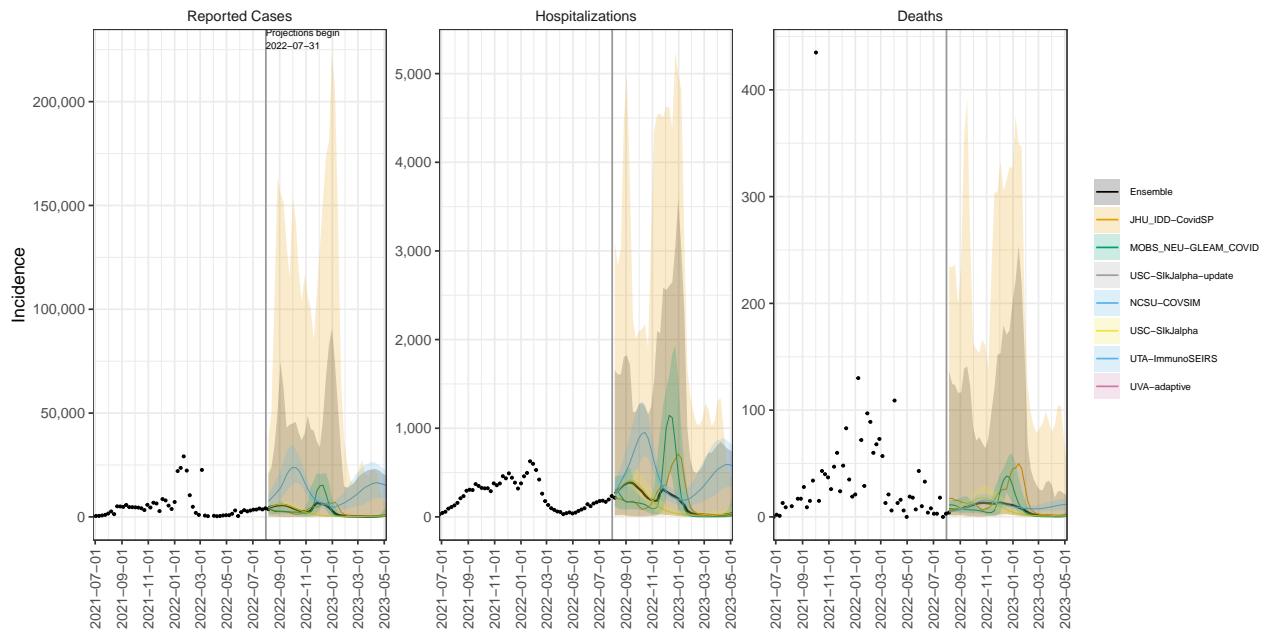
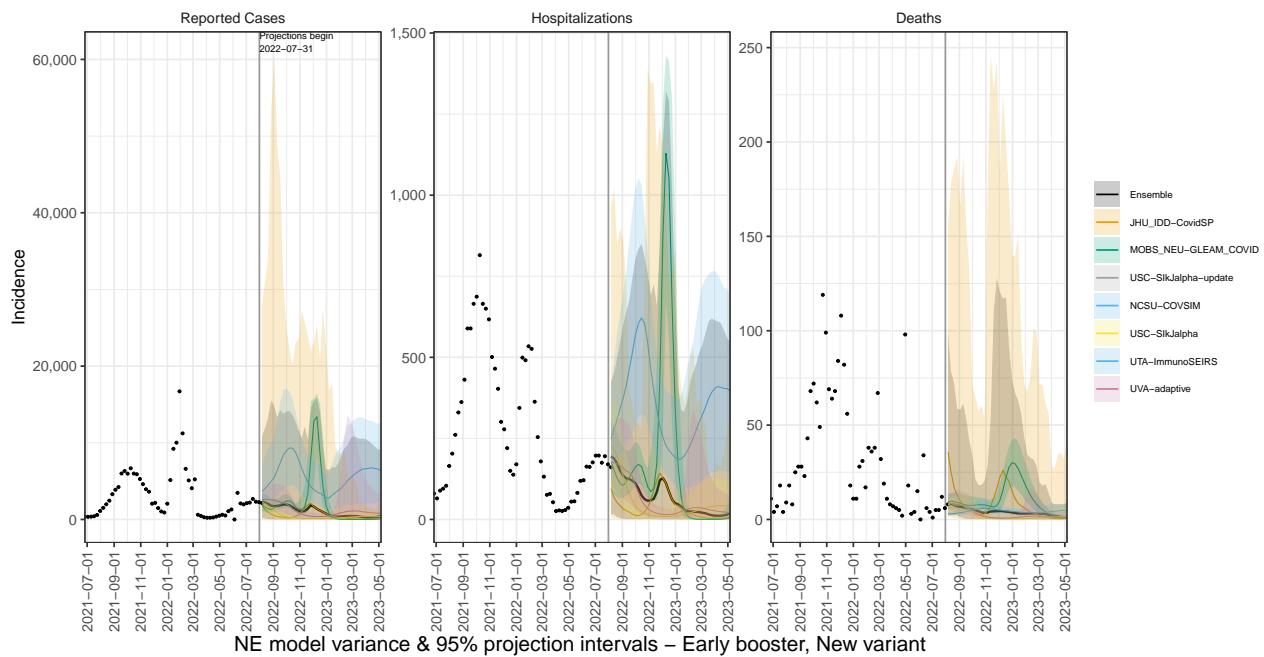
MS model variance & 95% projection intervals – Early booster, New variant



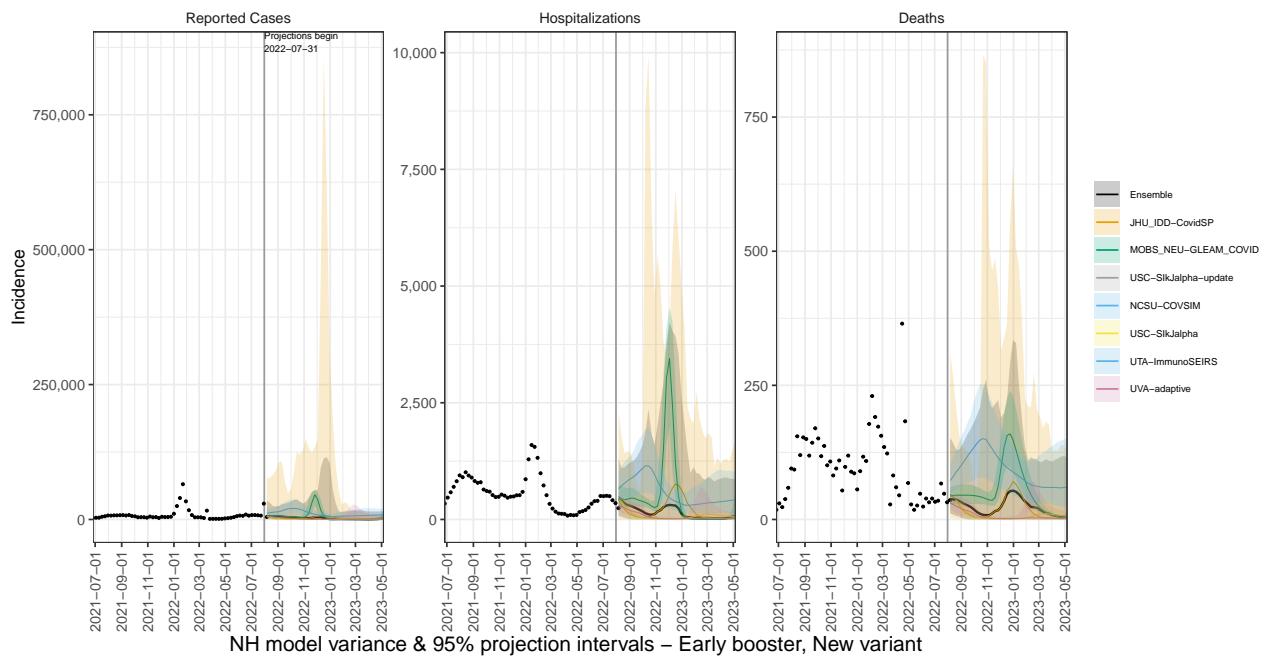
MO model variance & 95% projection intervals – Early booster, New variant



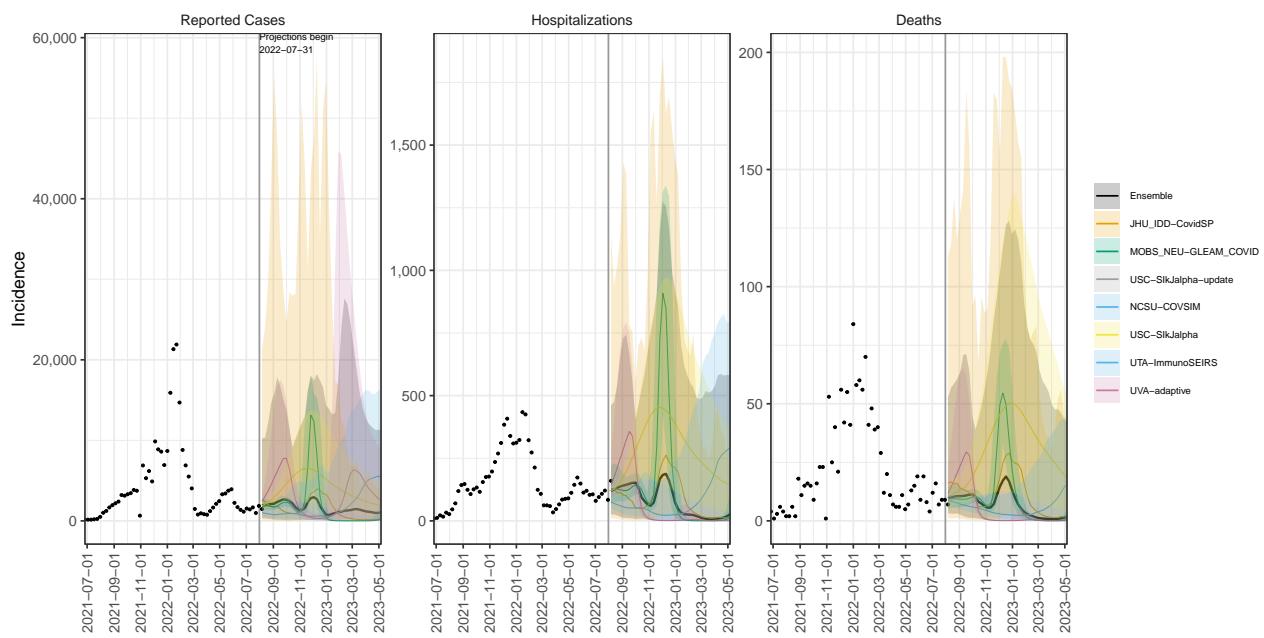
MT model variance & 95% projection intervals – Early booster, New variant



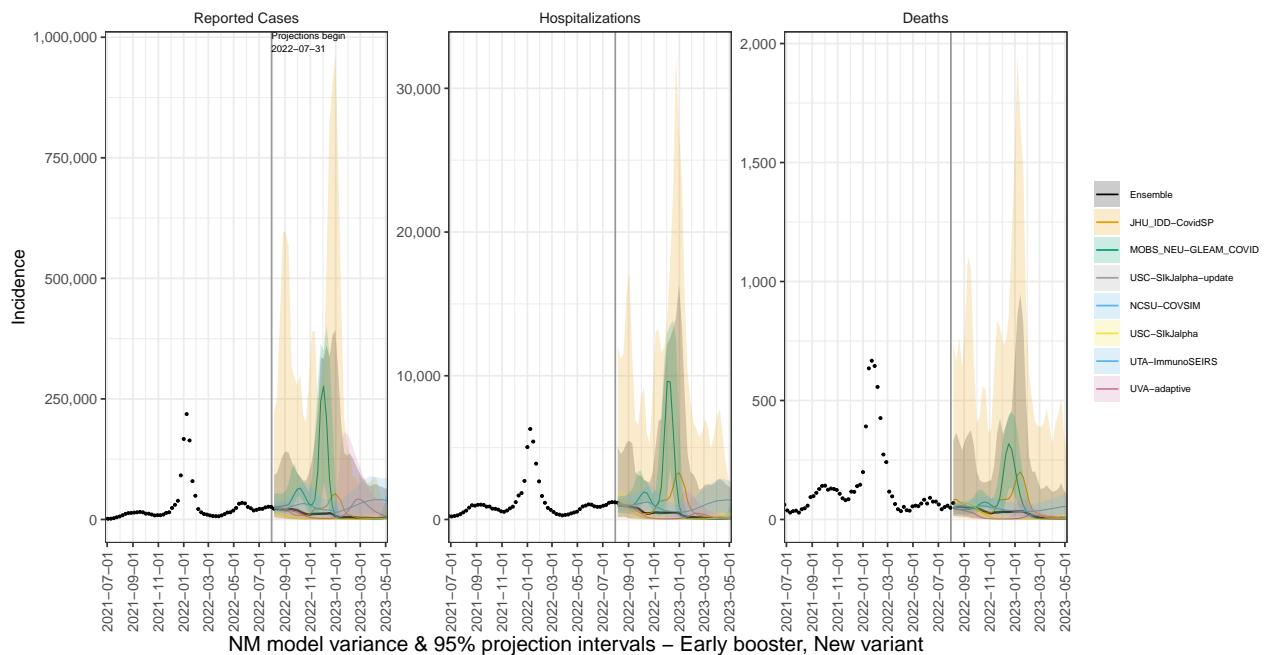
NV model variance & 95% projection intervals – Early booster, New variant



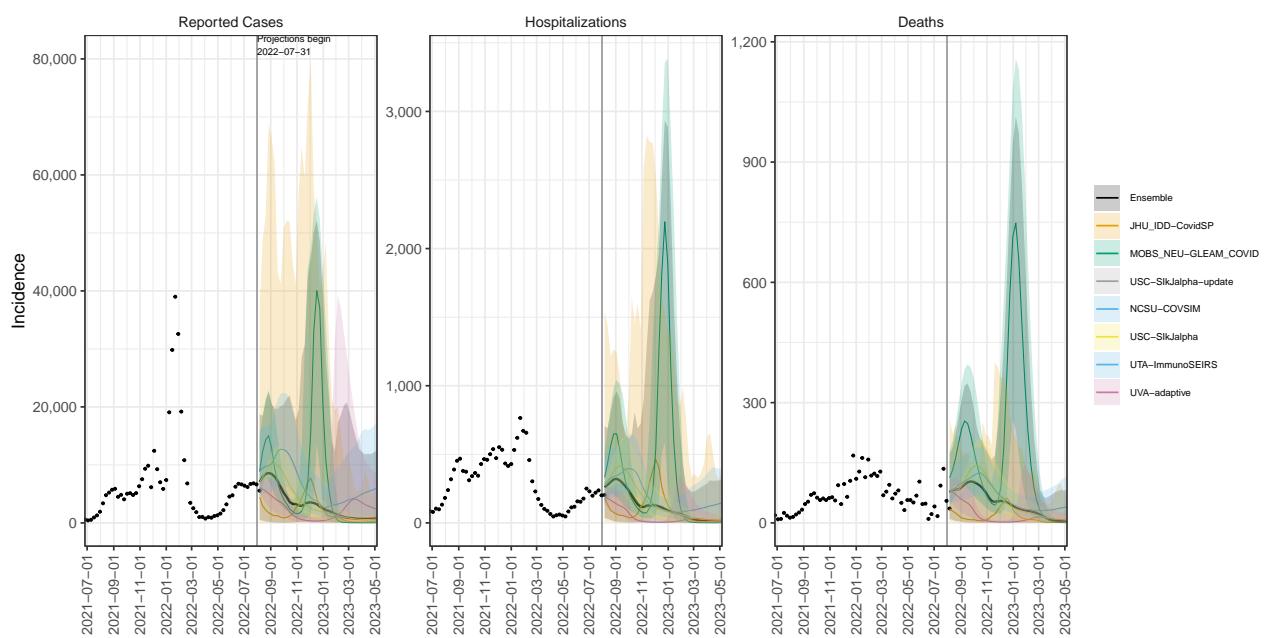
NH model variance & 95% projection intervals – Early booster, New variant



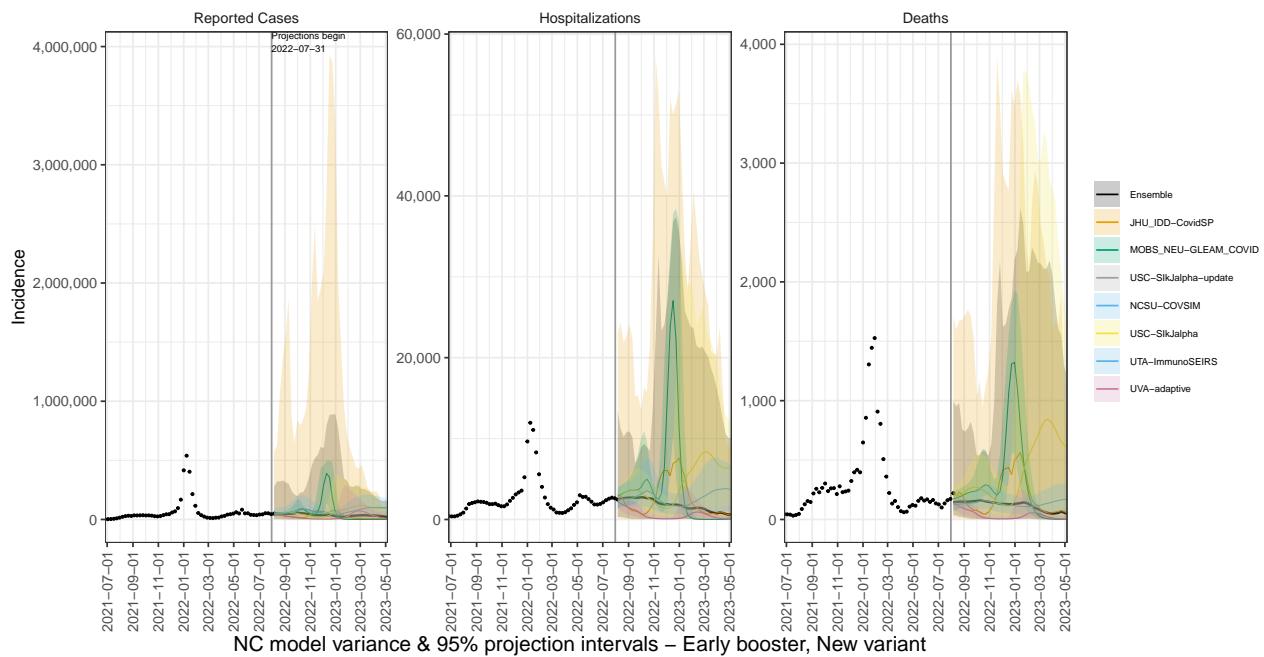
NJ model variance & 95% projection intervals – Early booster, New variant



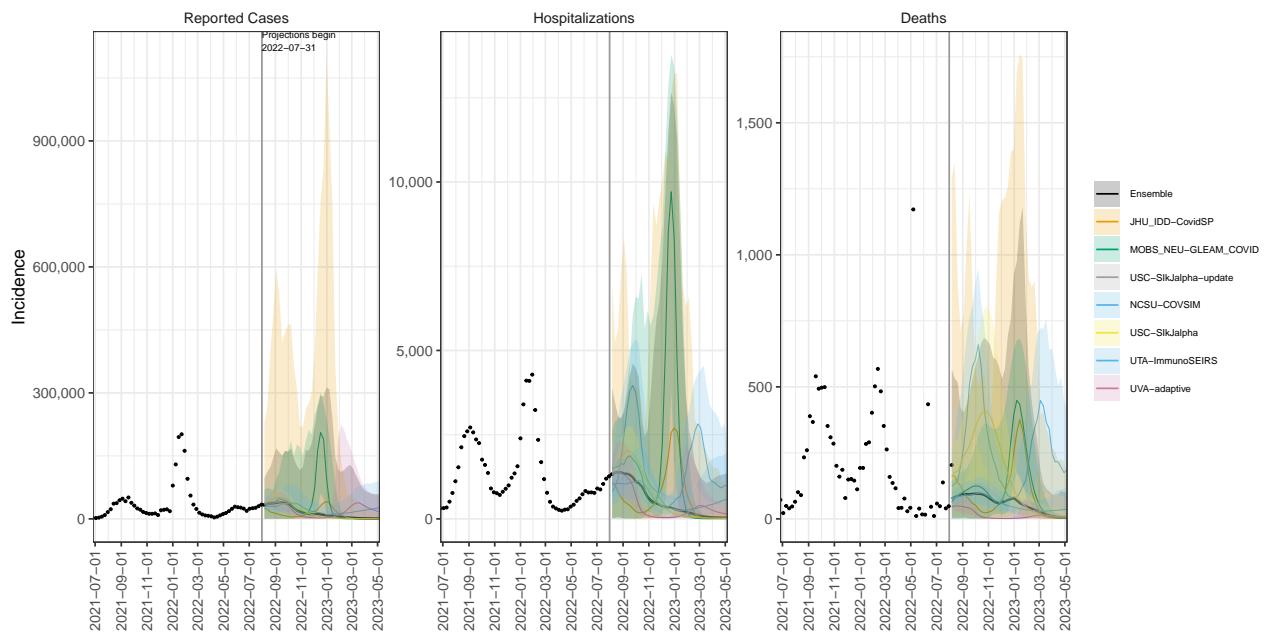
NM model variance & 95% projection intervals – Early booster, New variant



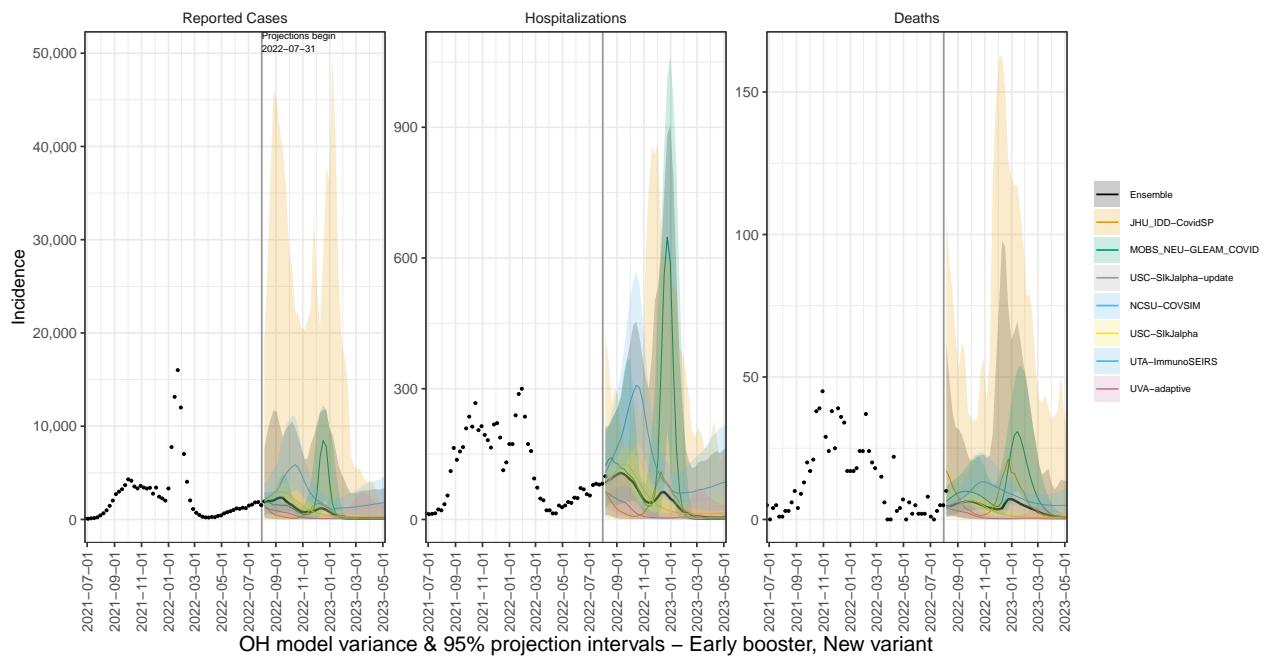
NY model variance & 95% projection intervals – Early booster, New variant



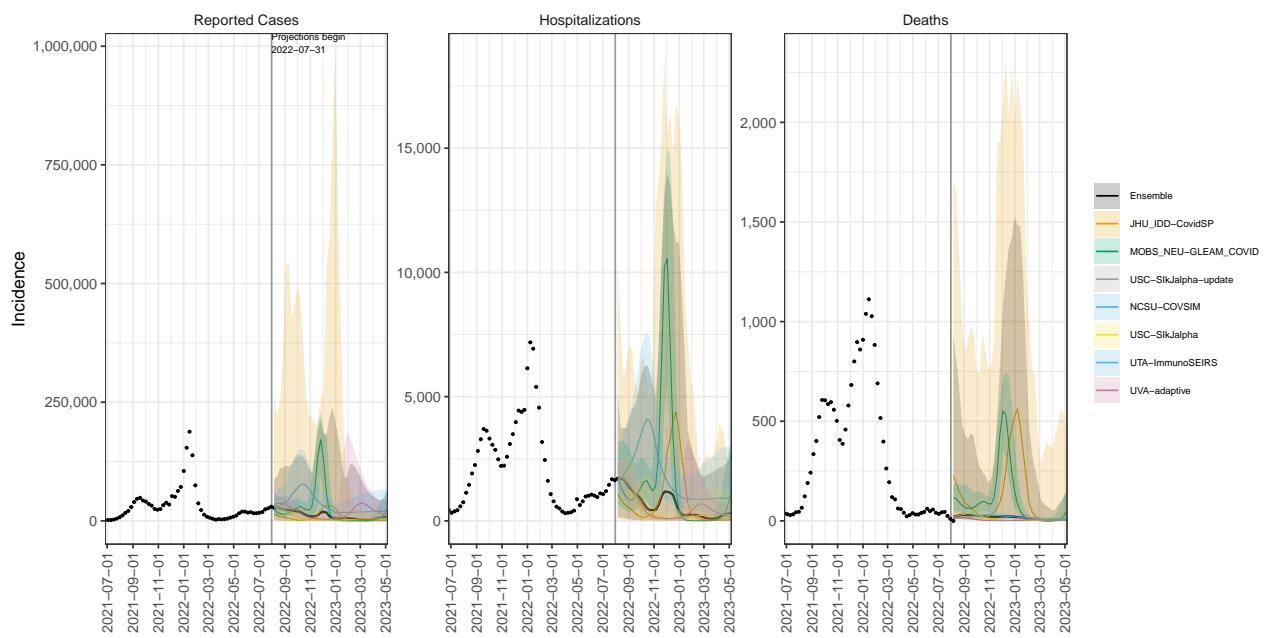
NC model variance & 95% projection intervals – Early booster, New variant



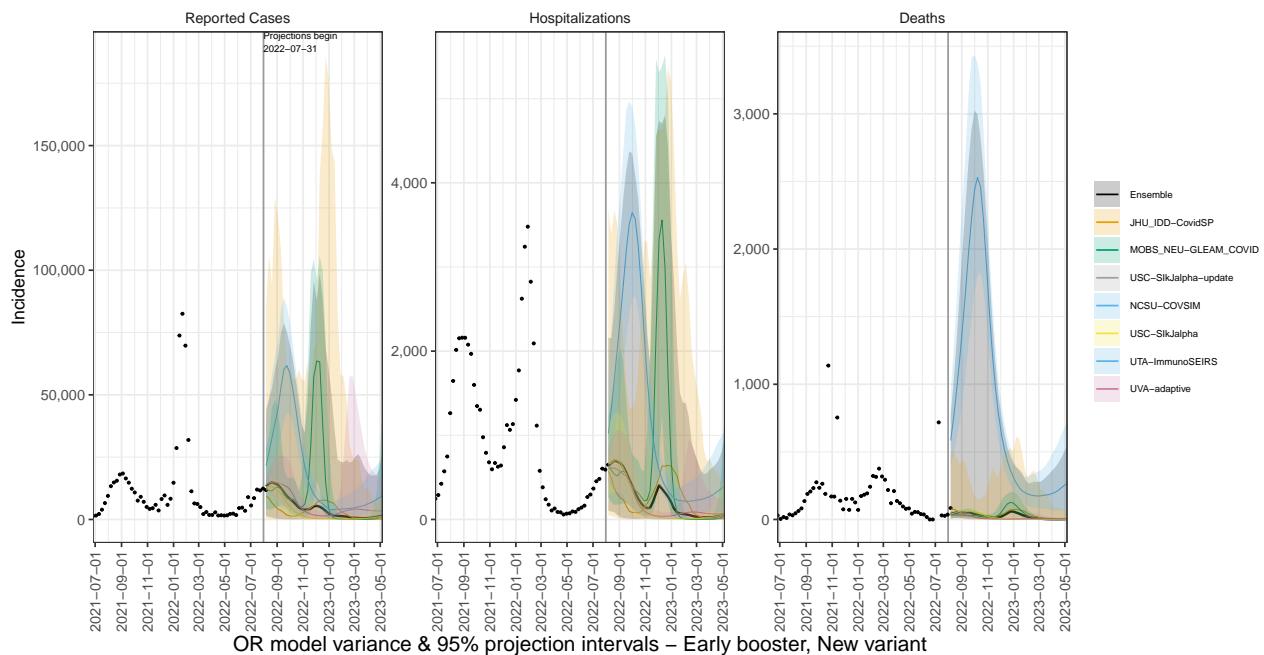
ND model variance & 95% projection intervals – Early booster, New variant



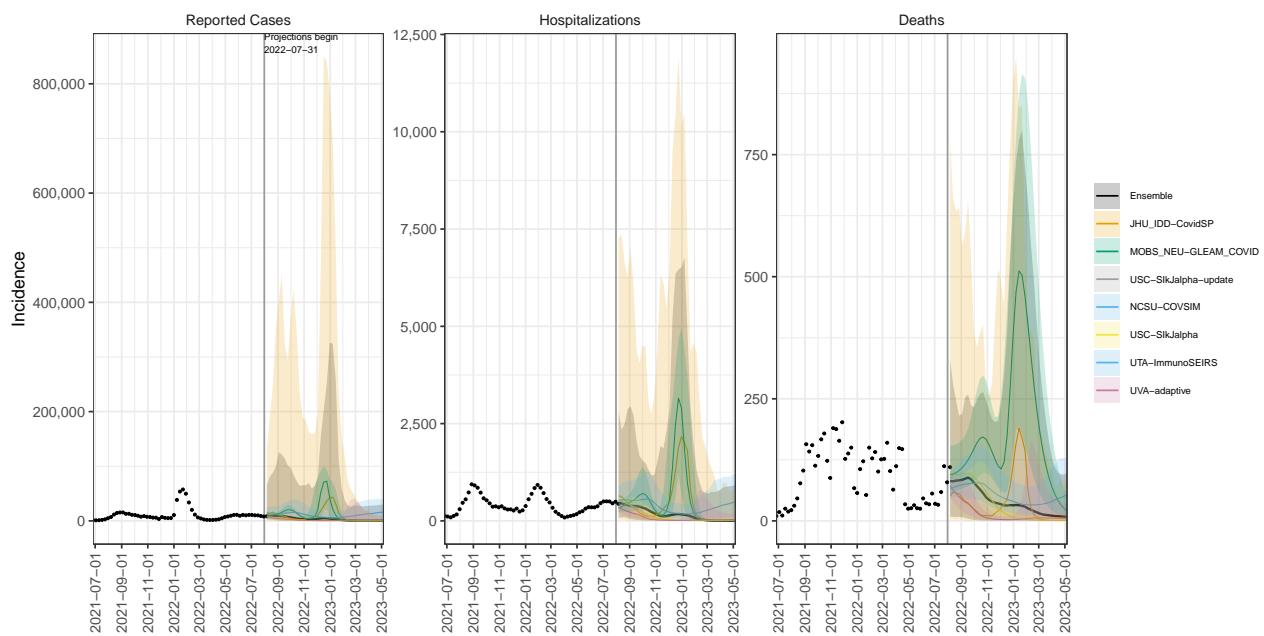
OH model variance & 95% projection intervals – Early booster, New variant



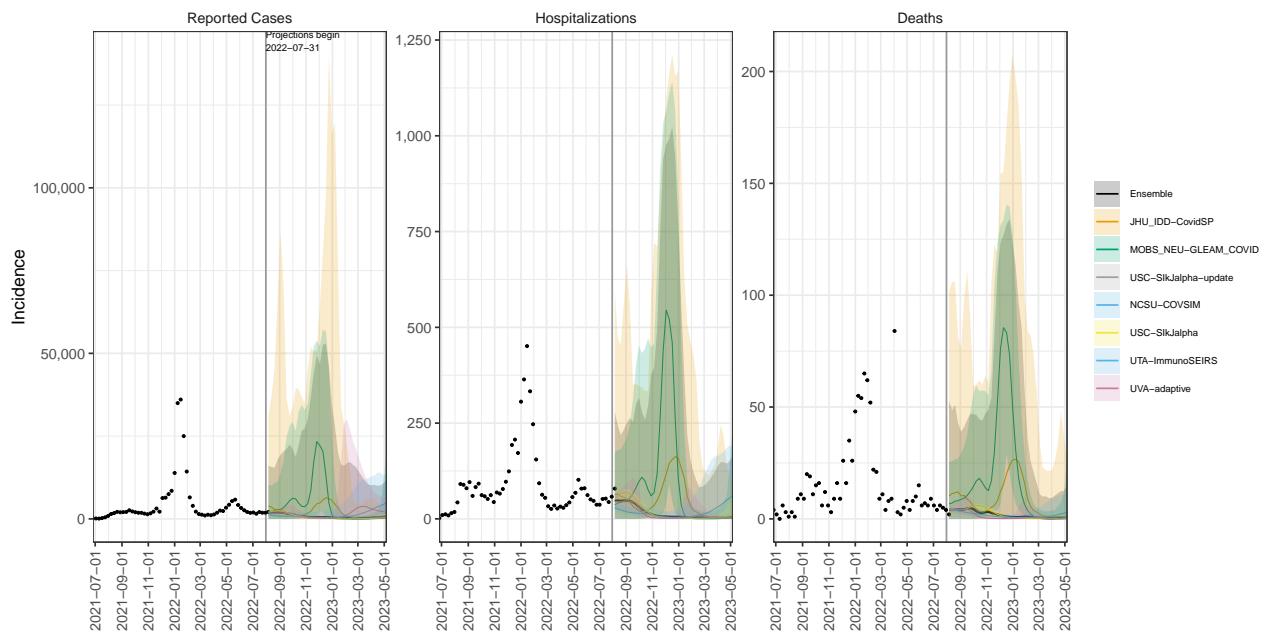
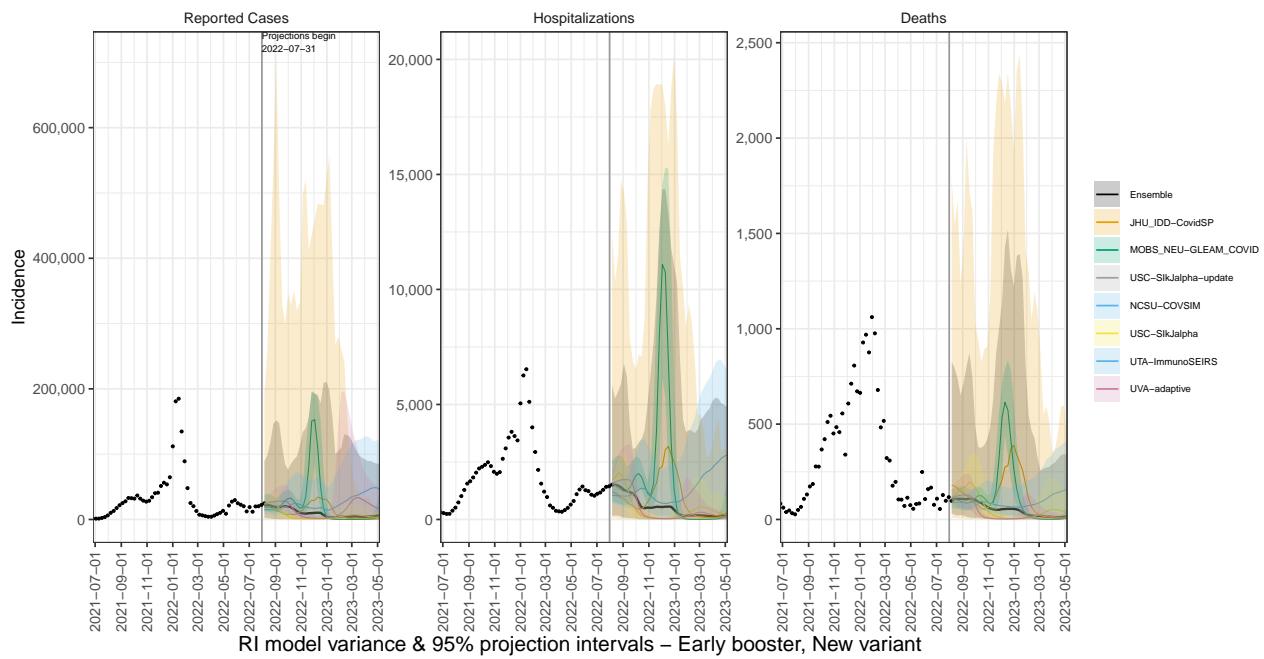
OK model variance & 95% projection intervals – Early booster, New variant



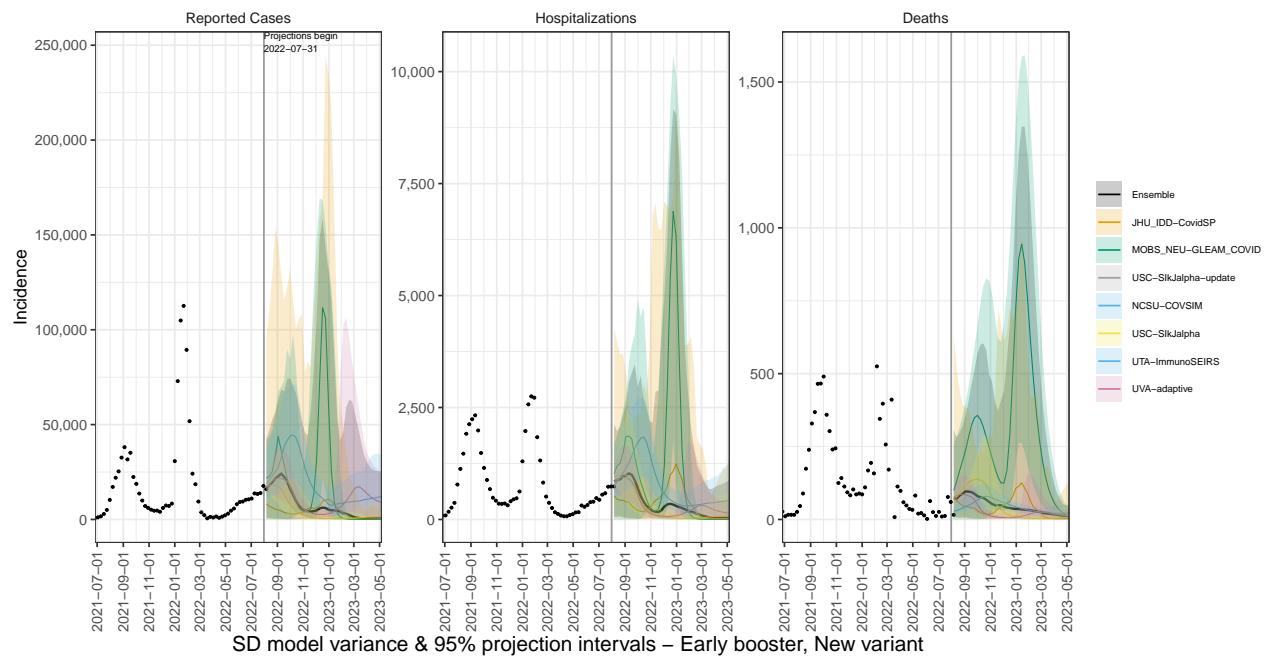
OR model variance & 95% projection intervals – Early booster, New variant



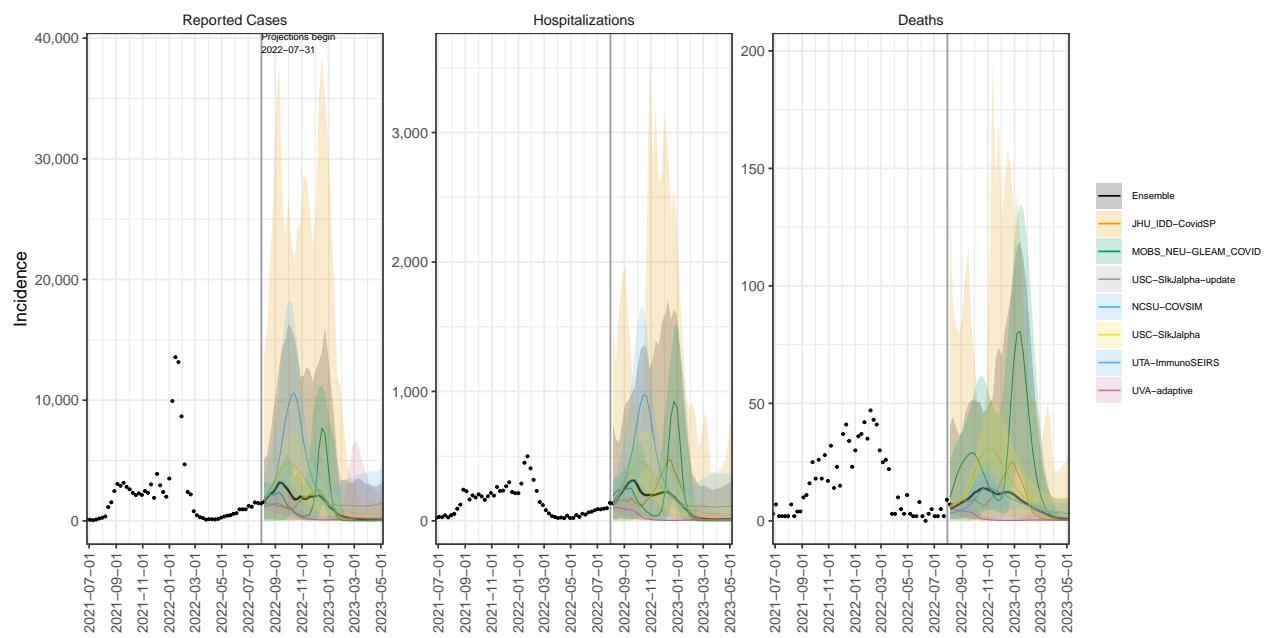
PA model variance & 95% projection intervals – Early booster, New variant



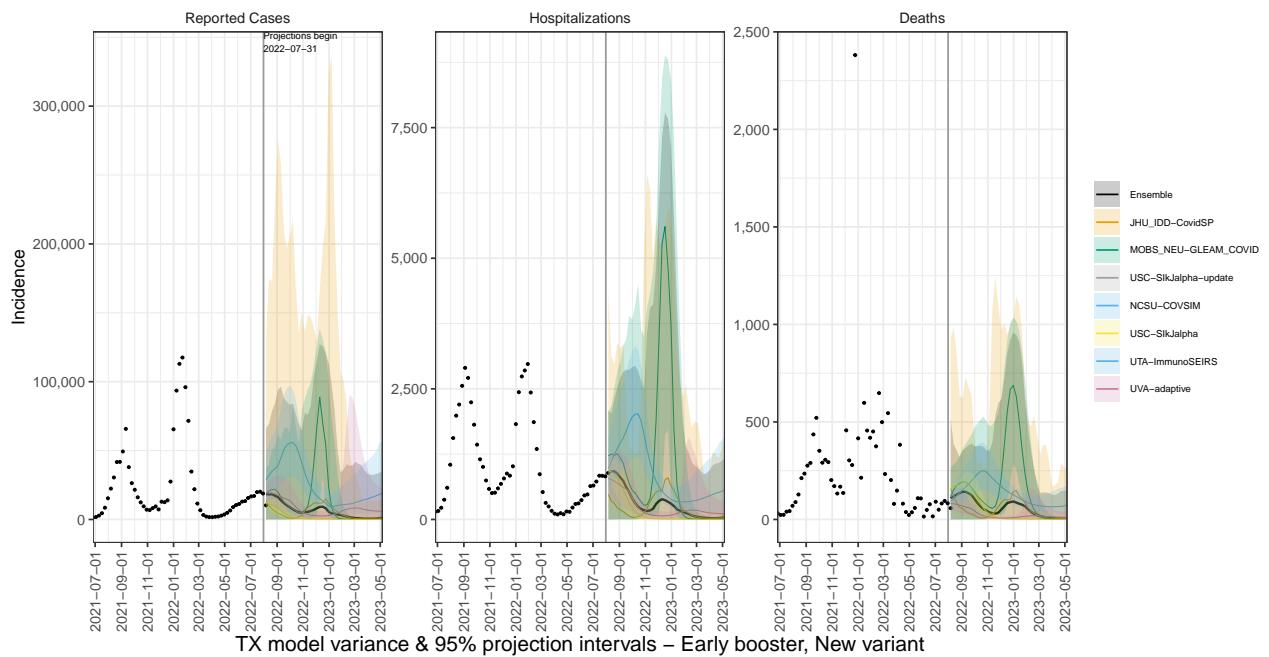
SC model variance & 95% projection intervals – Early booster, New variant



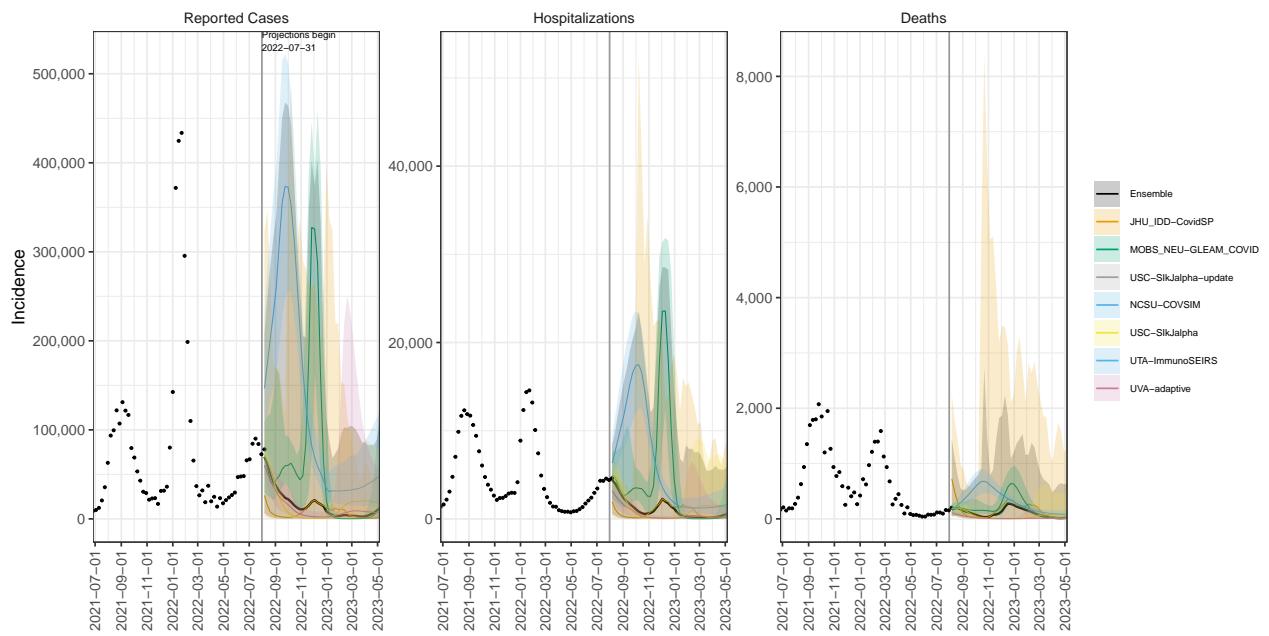
SD model variance & 95% projection intervals – Early booster, New variant



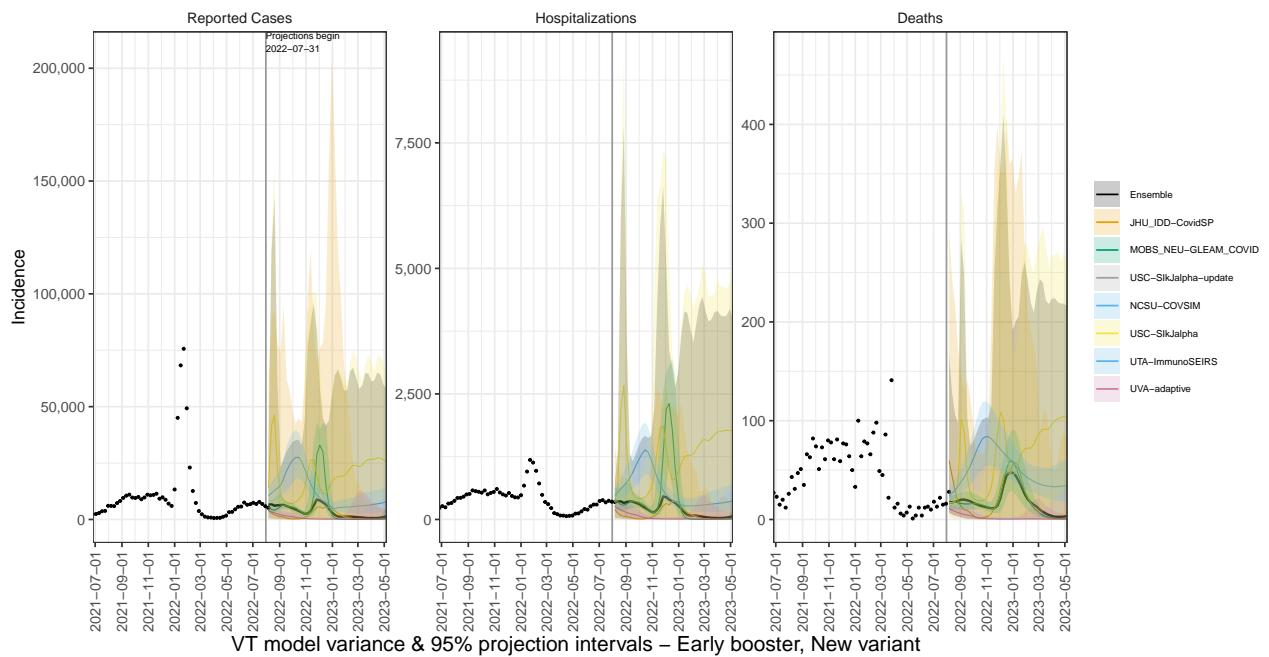
TN model variance & 95% projection intervals – Early booster, New variant



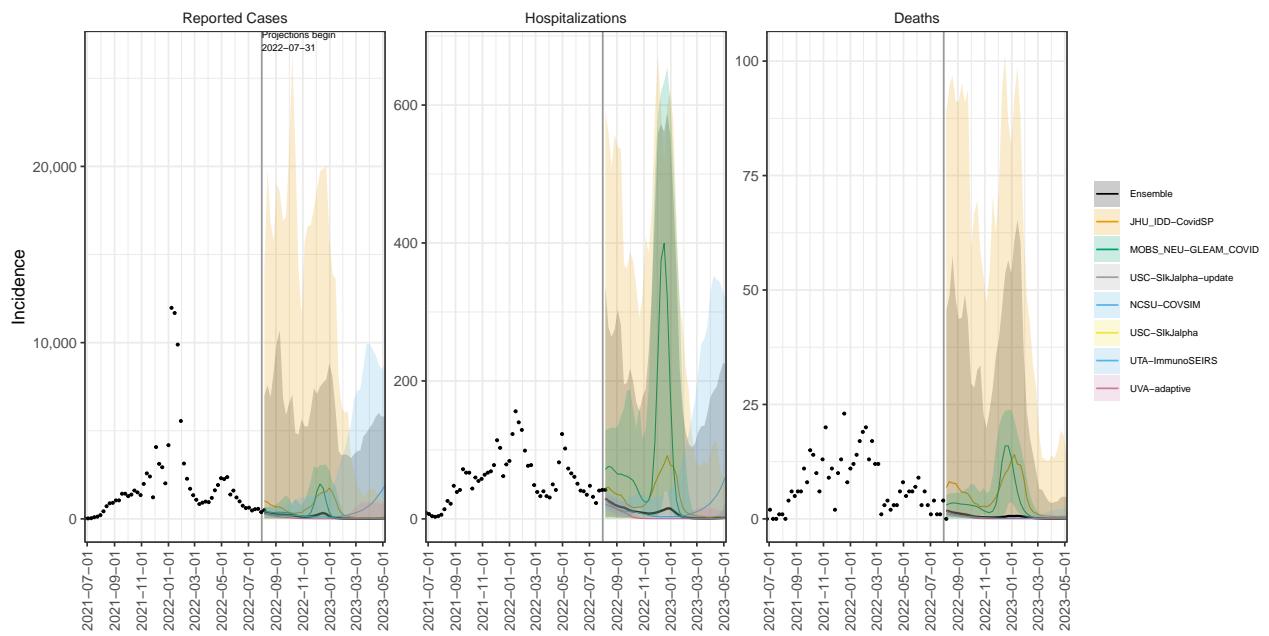
TX model variance & 95% projection intervals – Early booster, New variant



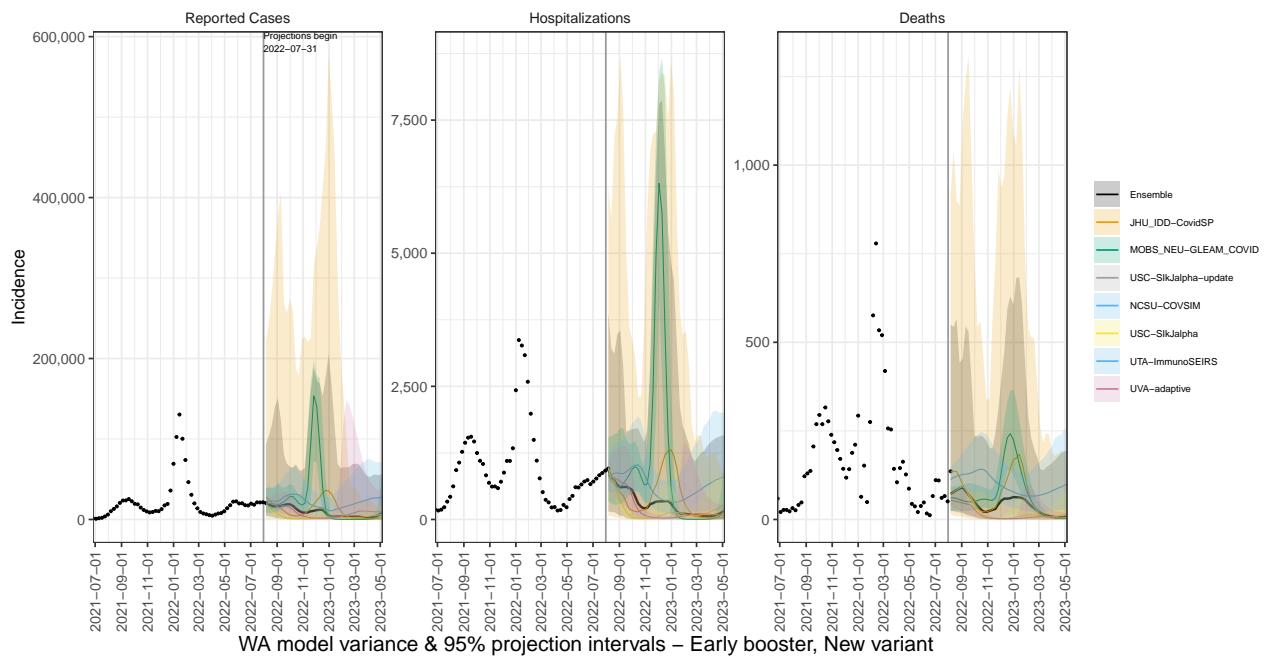
UT model variance & 95% projection intervals – Early booster, New variant



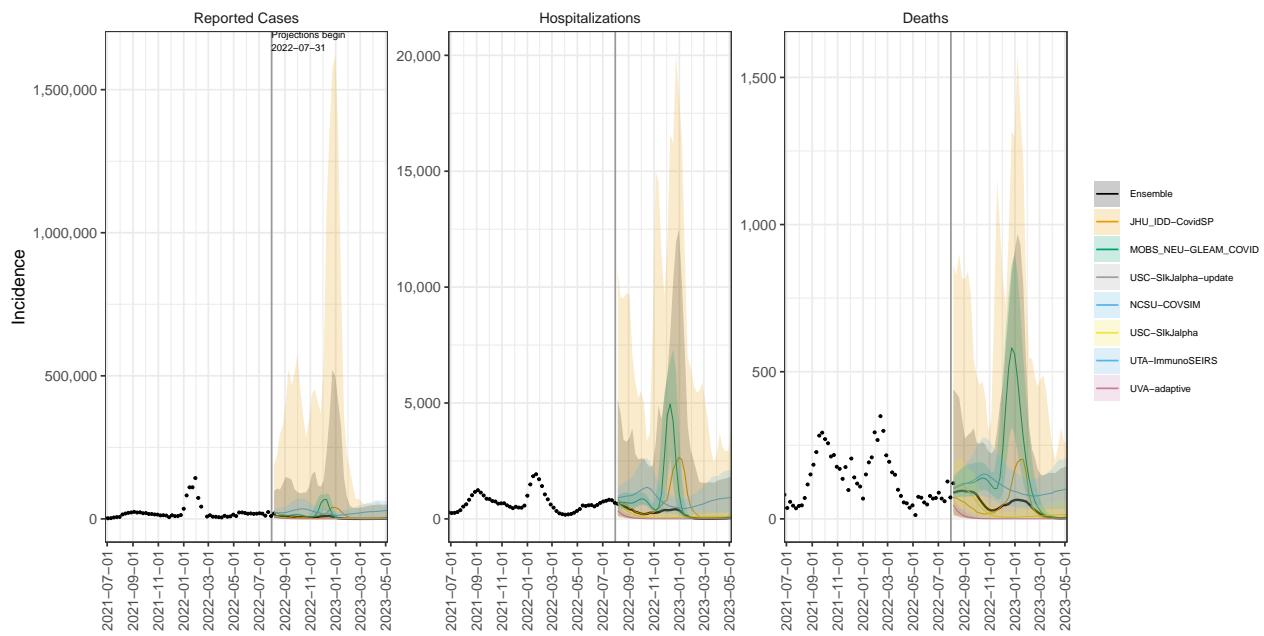
VT model variance & 95% projection intervals – Early booster, New variant



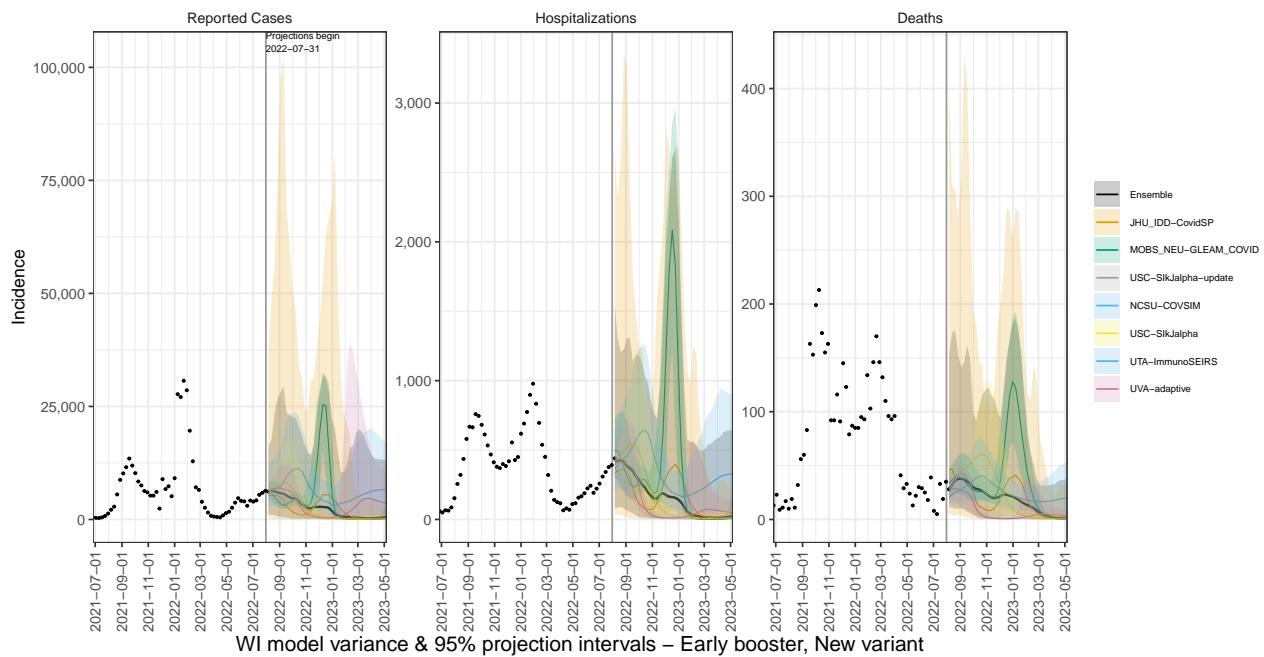
VA model variance & 95% projection intervals – Early booster, New variant



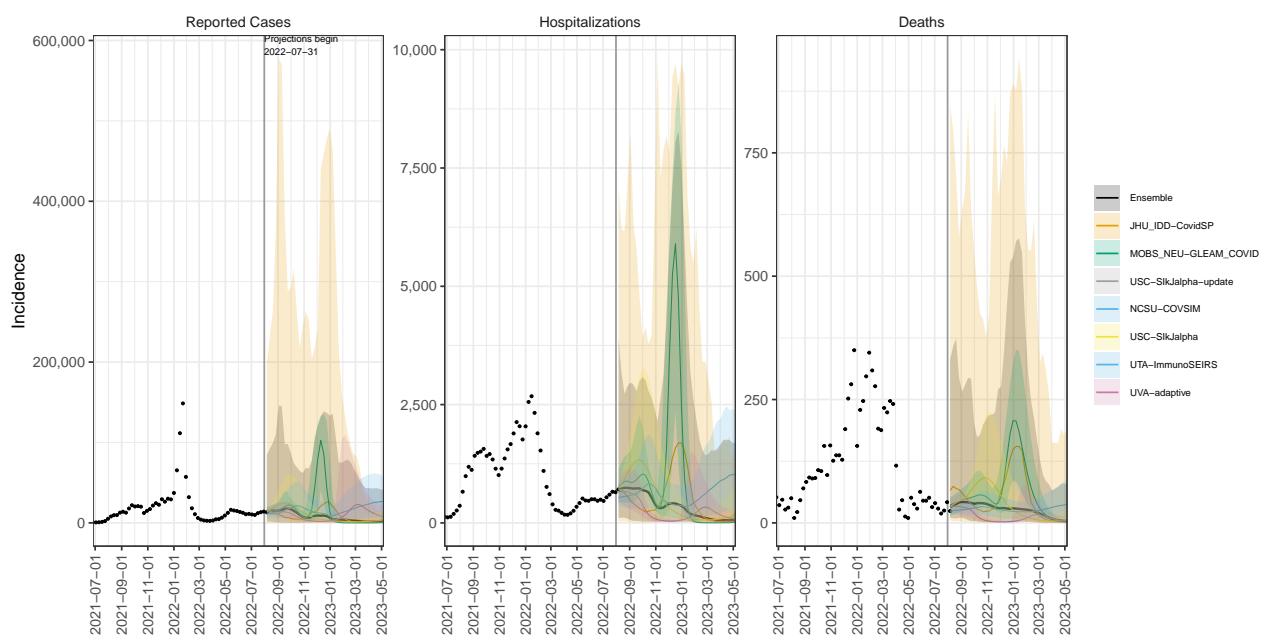
WA model variance & 95% projection intervals – Early booster, New variant



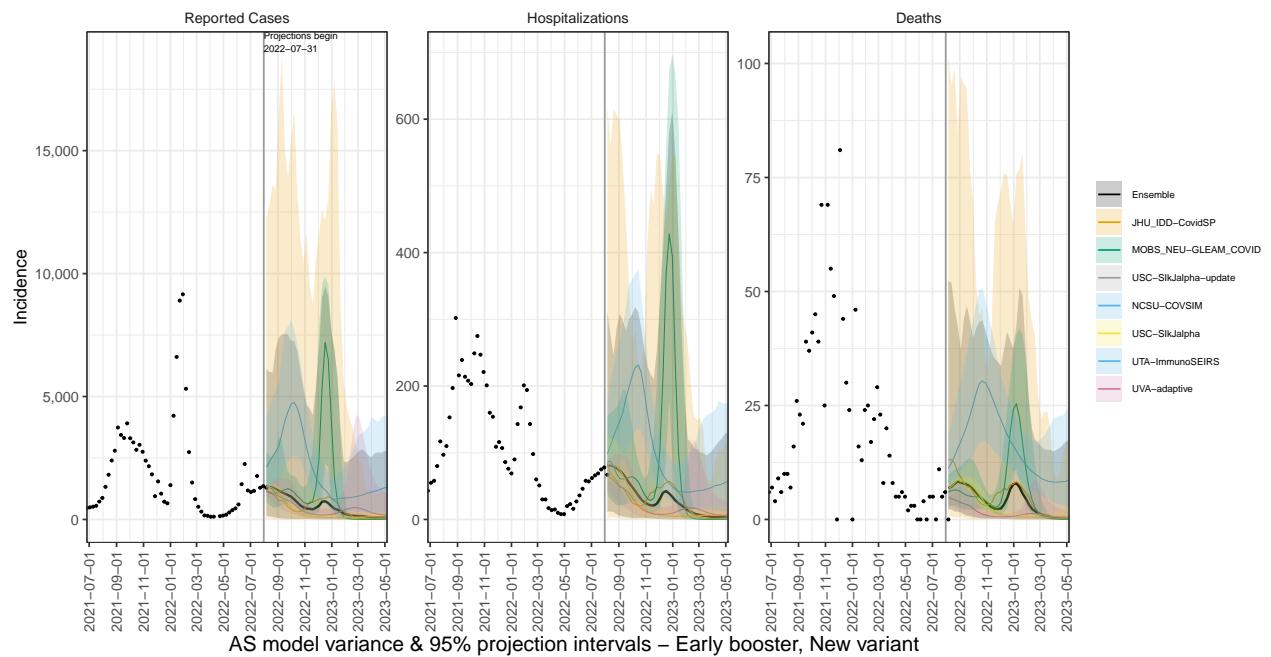
WV model variance & 95% projection intervals – Early booster, New variant



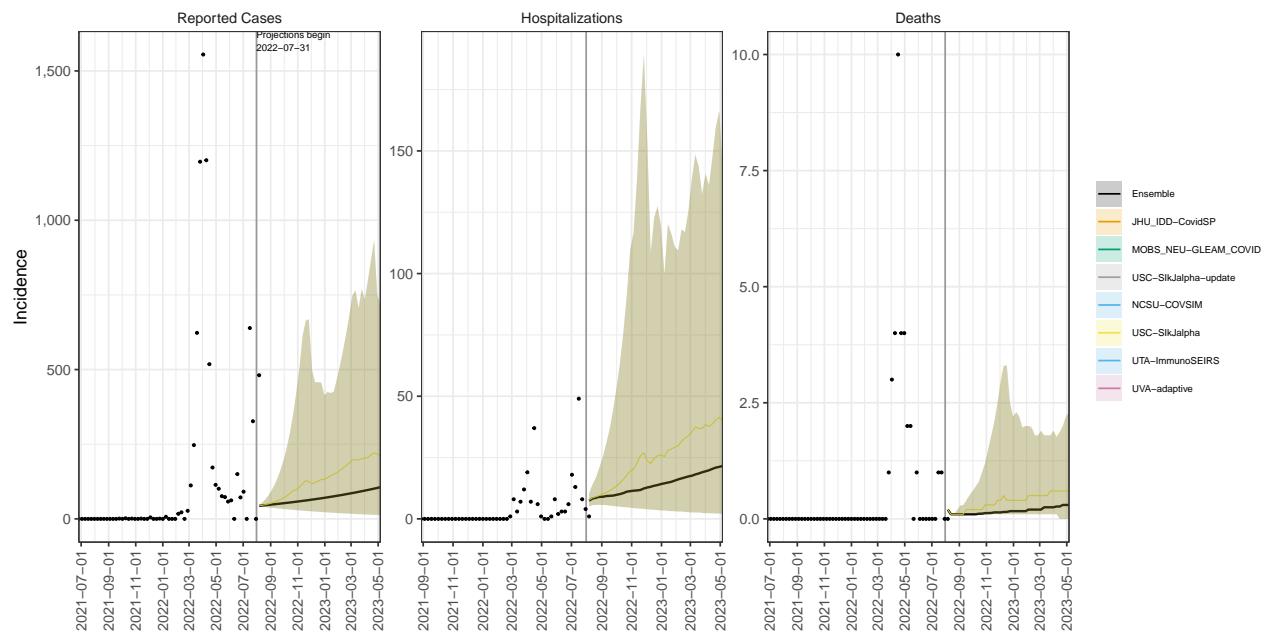
WI model variance & 95% projection intervals – Early booster, New variant



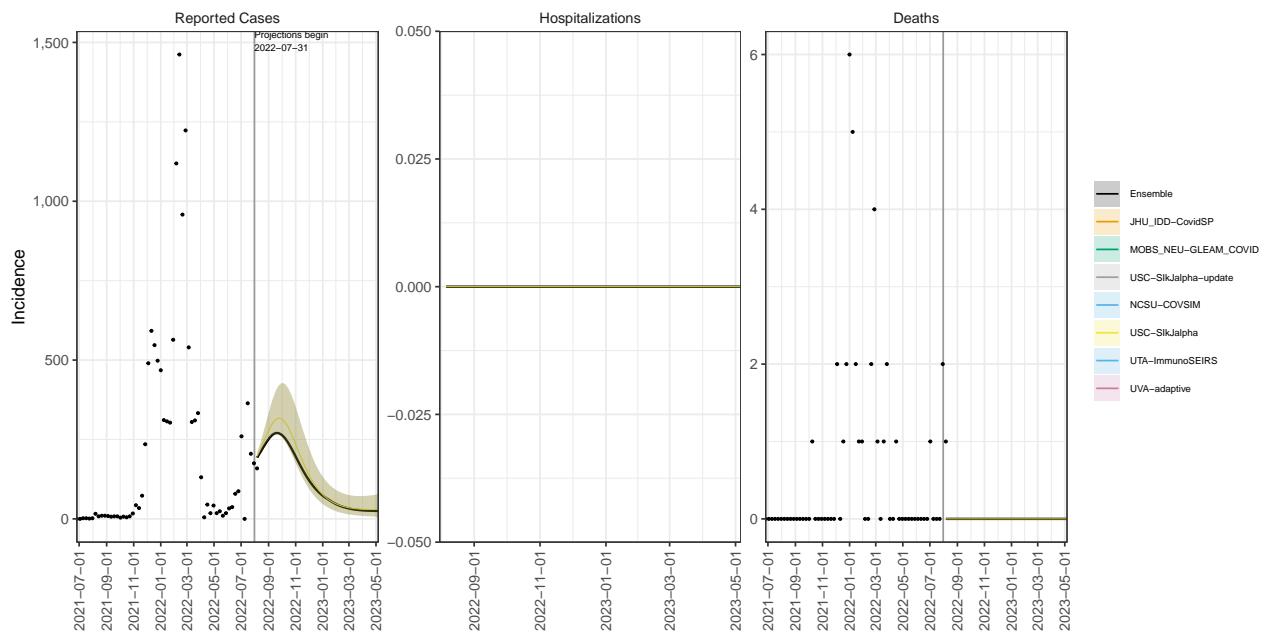
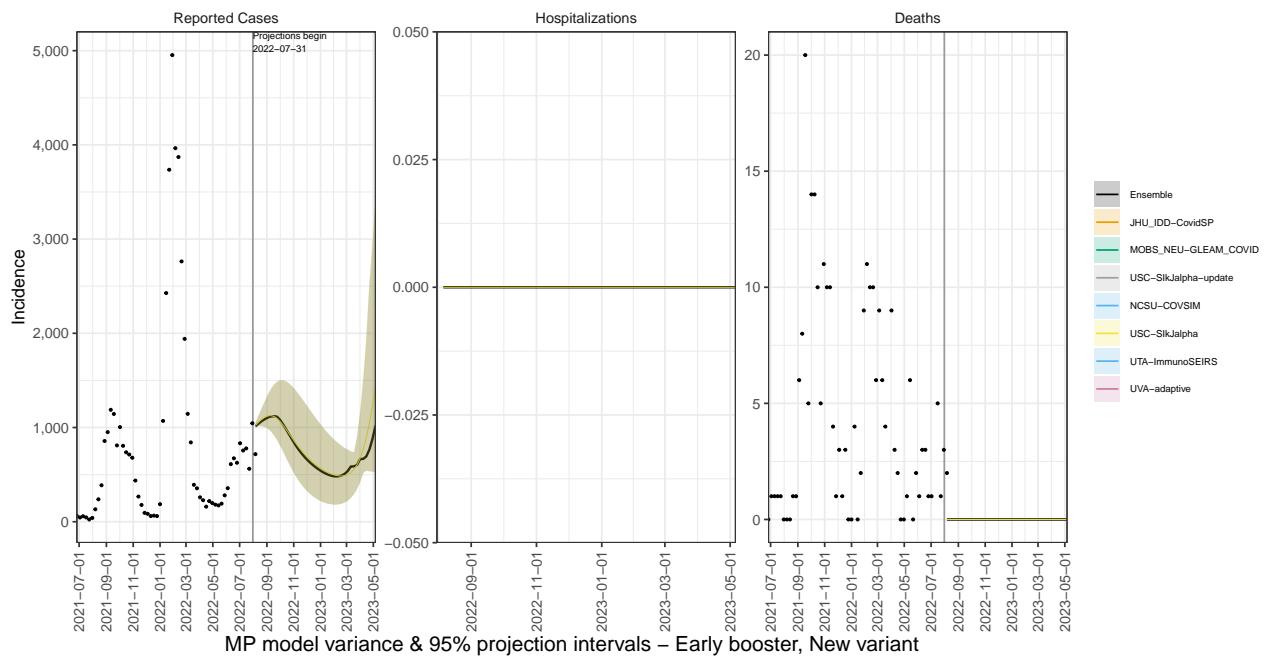
WY model variance & 95% projection intervals – Early booster, New variant



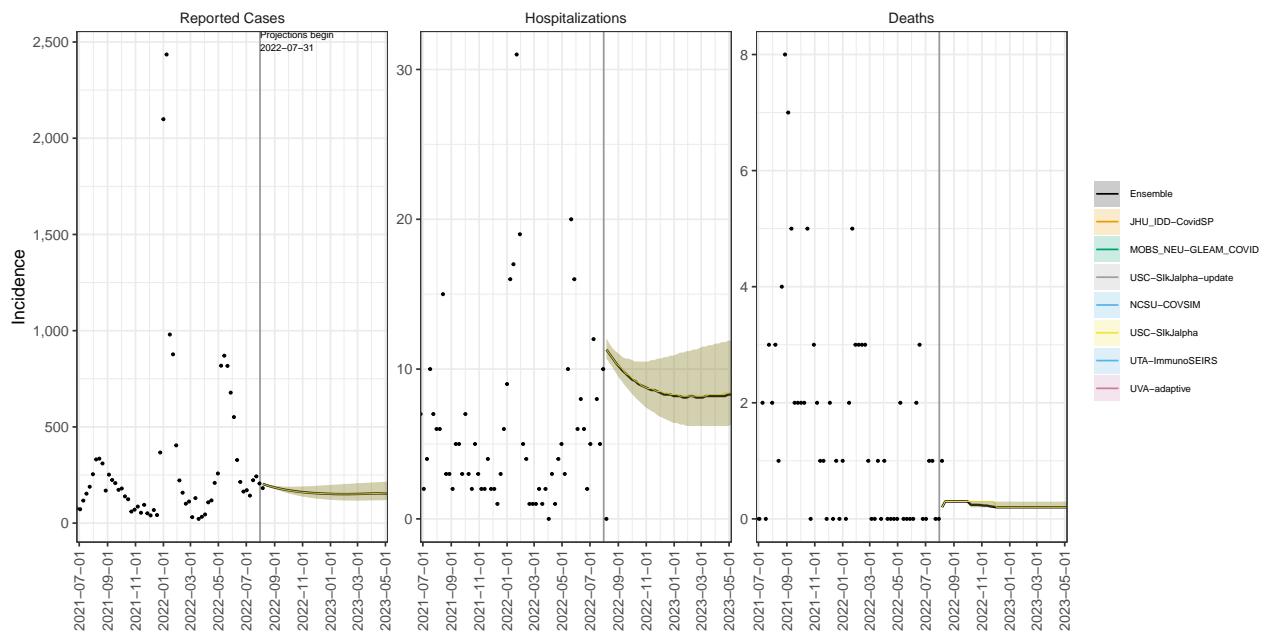
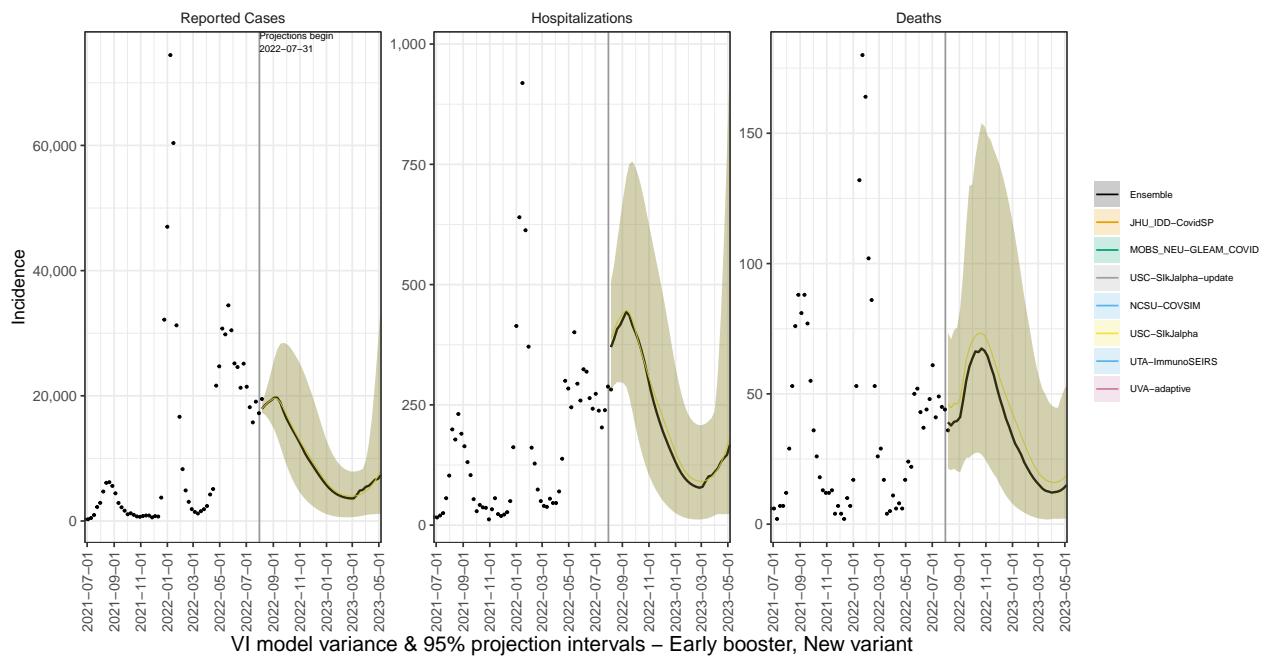
AS model variance & 95% projection intervals – Early booster, New variant



GU model variance & 95% projection intervals – Early booster, New variant

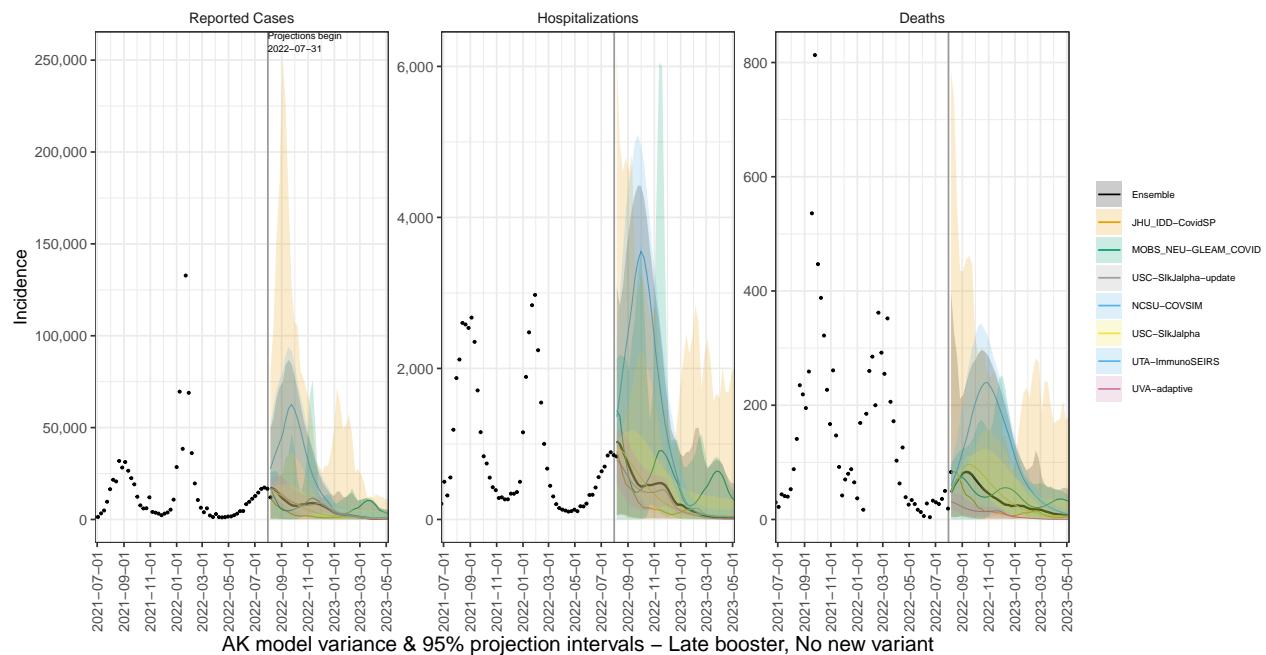


PR model variance & 95% projection intervals – Early booster, New variant

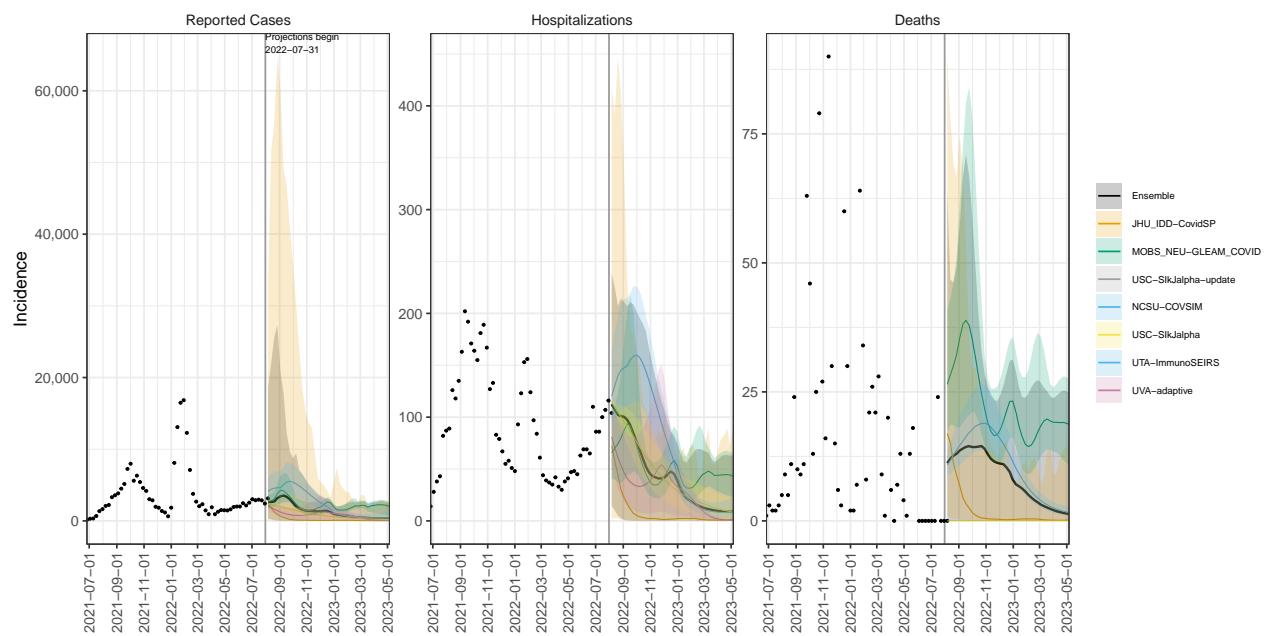


National model variation for the Late booster, No new variant scenario

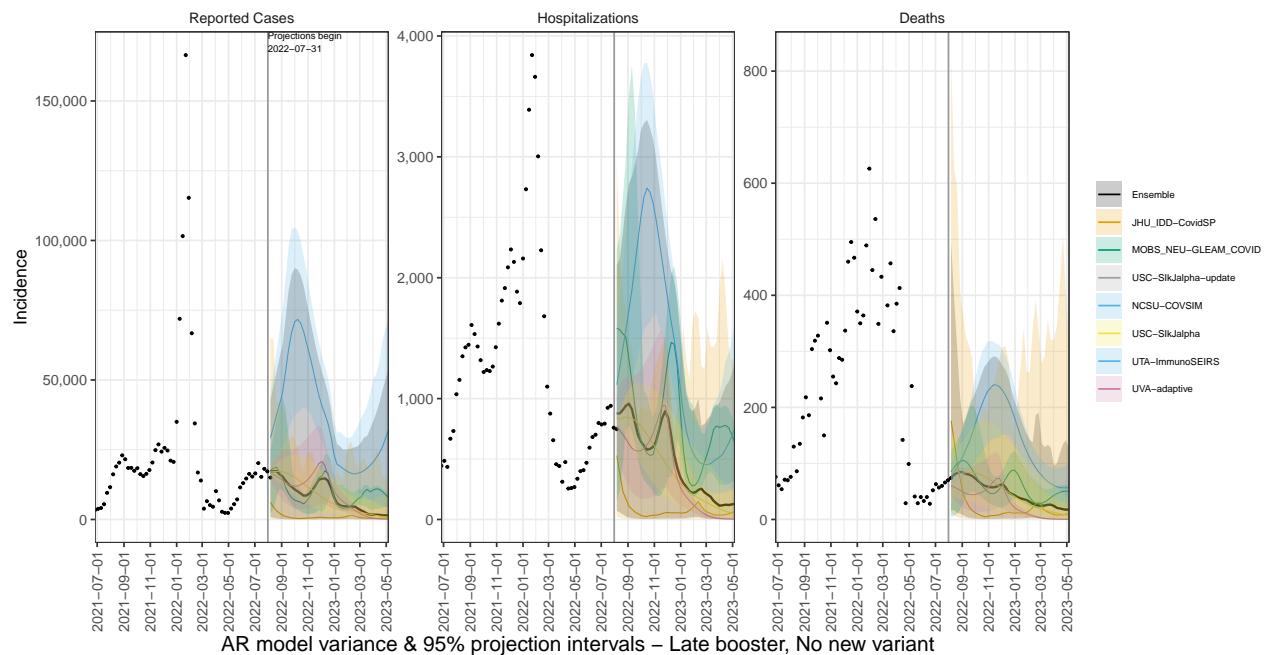
AL model variance & 95% projection intervals – Late booster, No new variant



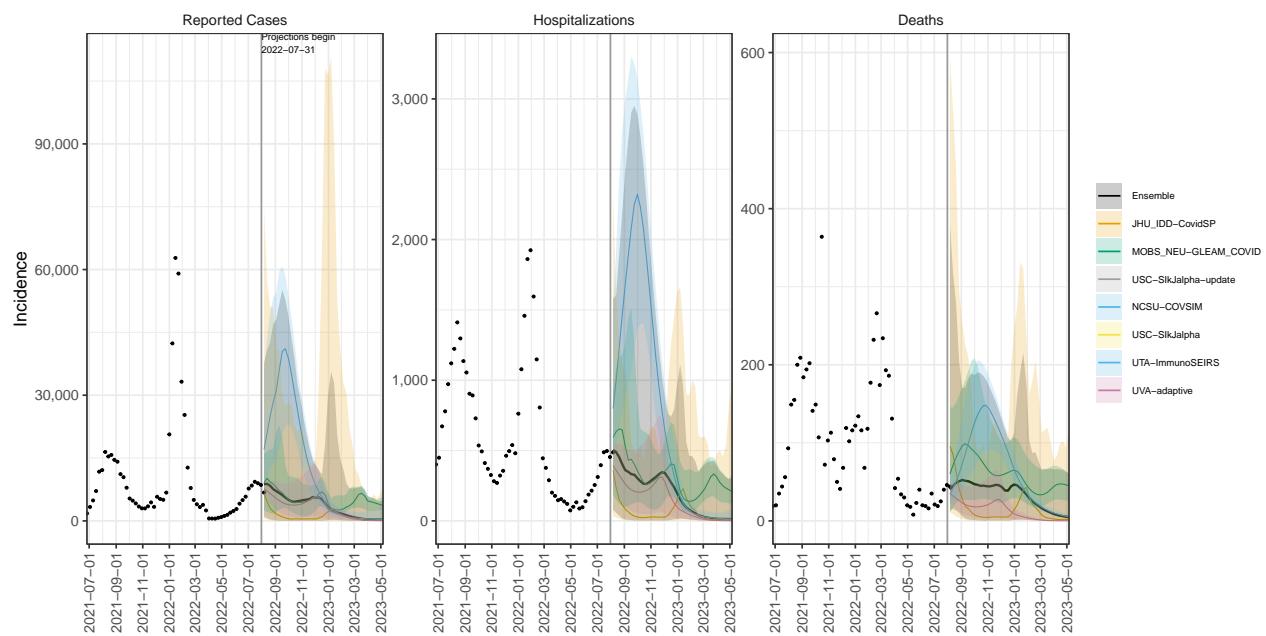
AK model variance & 95% projection intervals – Late booster, No new variant



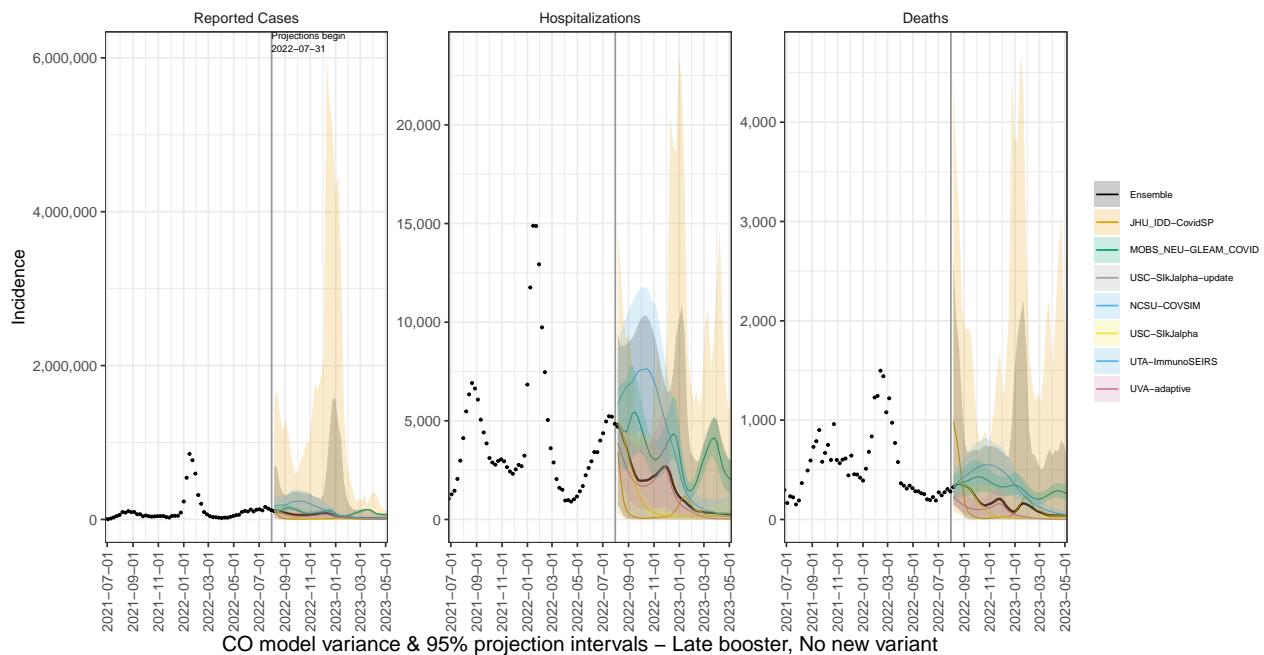
AZ model variance & 95% projection intervals – Late booster, No new variant



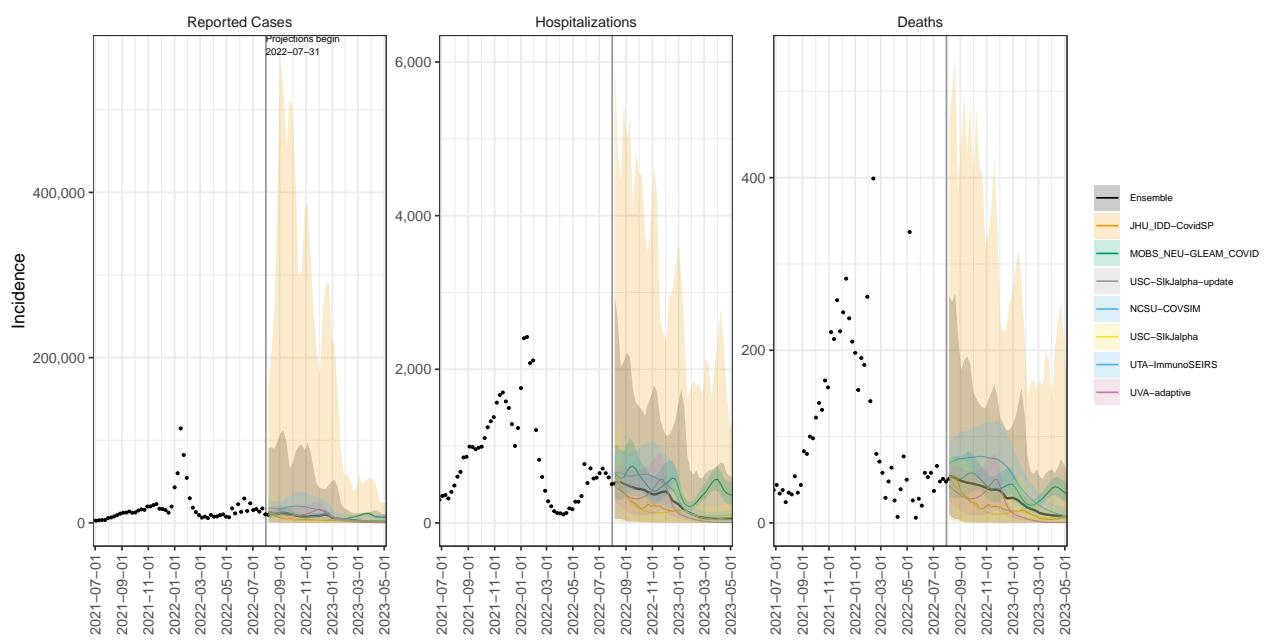
AR model variance & 95% projection intervals – Late booster, No new variant



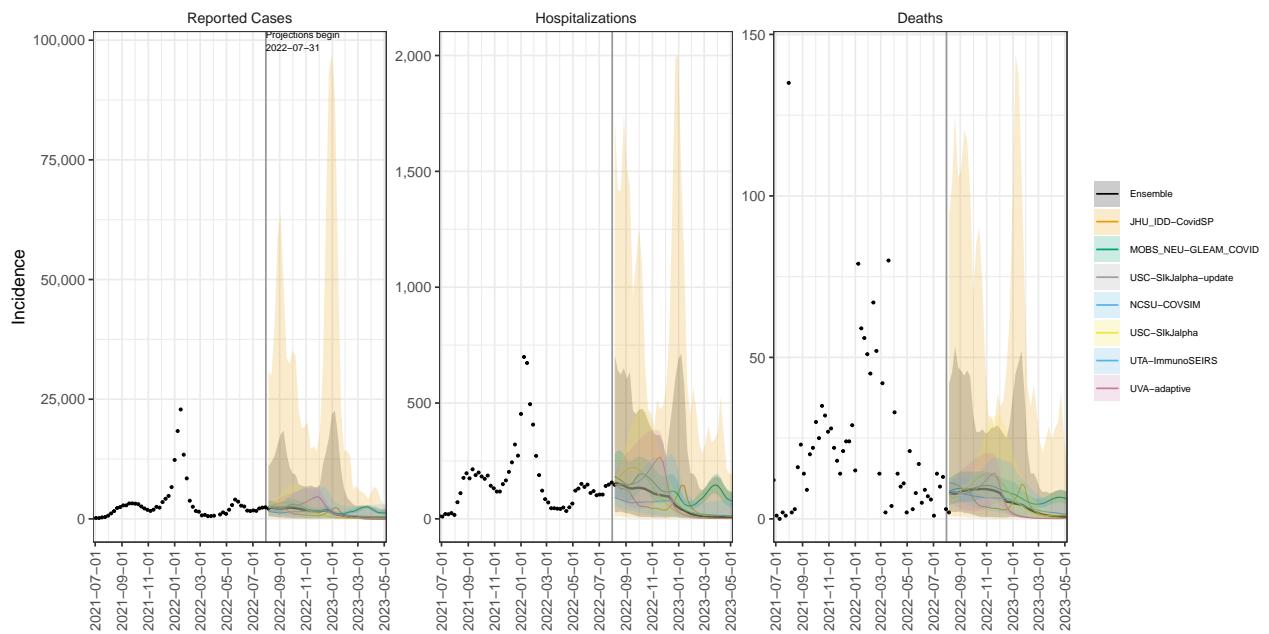
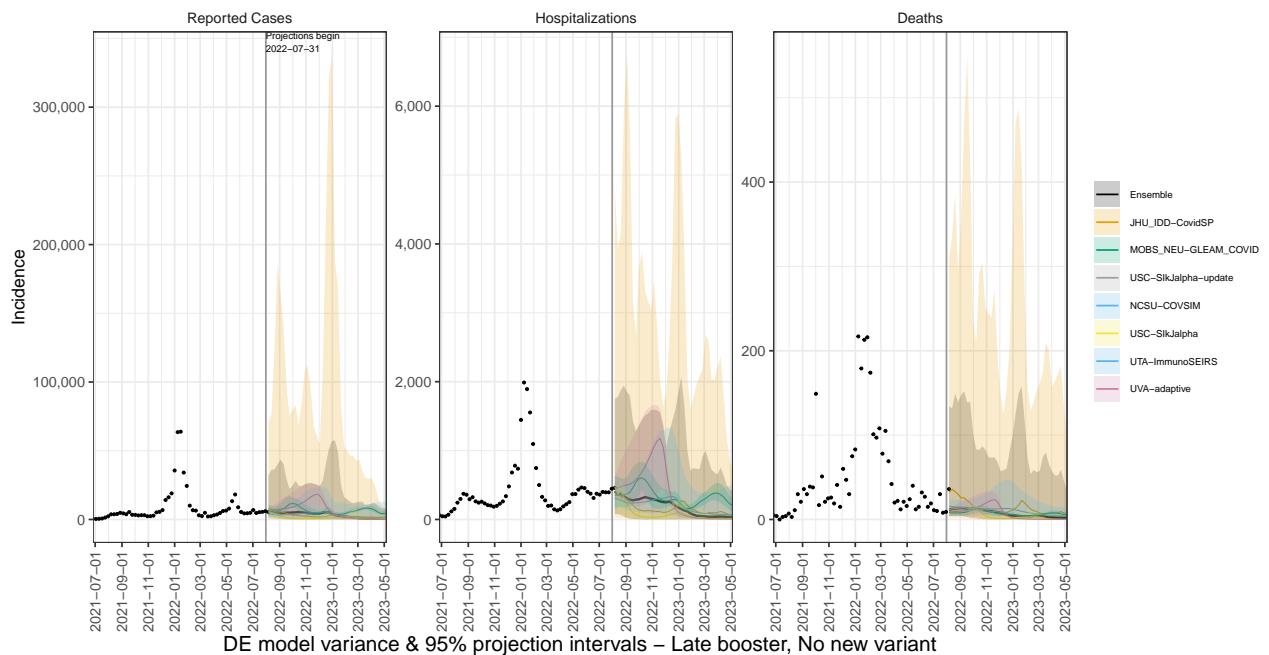
CA model variance & 95% projection intervals – Late booster, No new variant



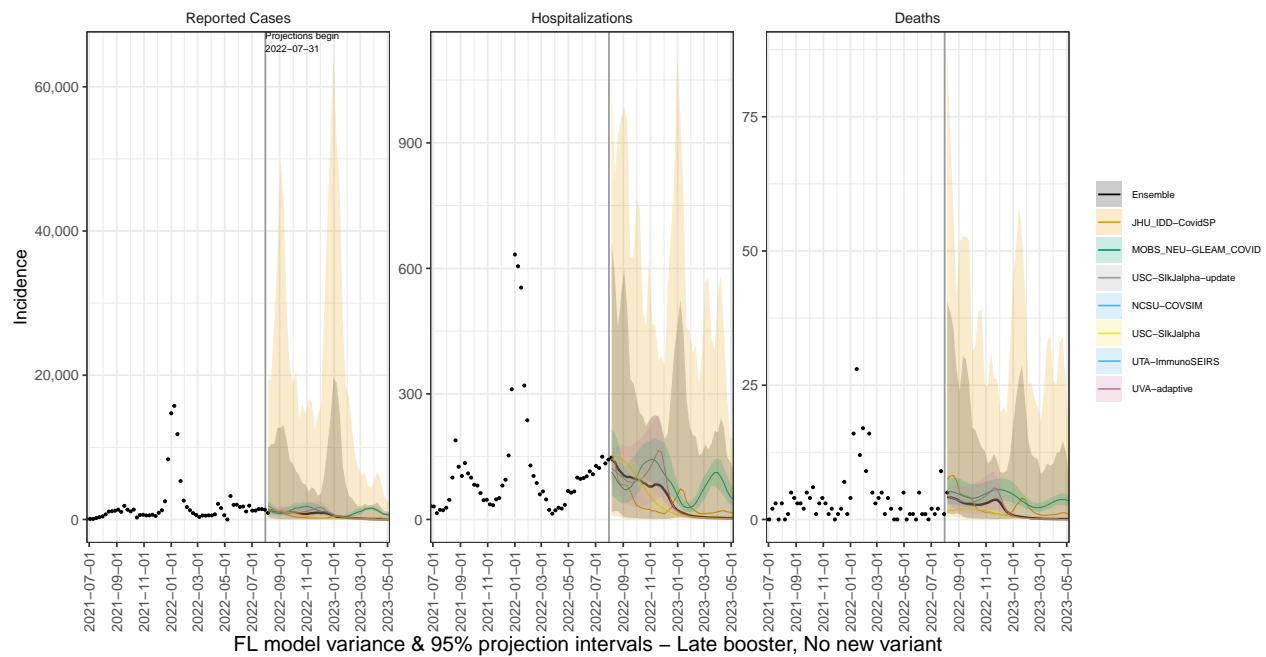
CO model variance & 95% projection intervals – Late booster, No new variant



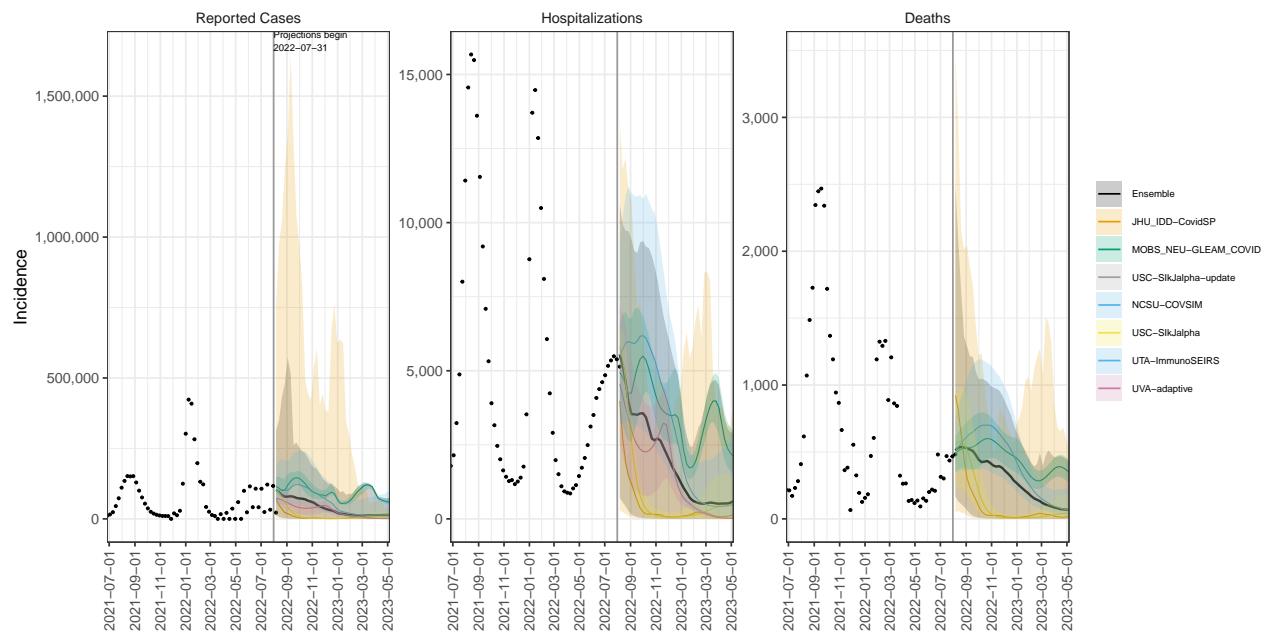
CT model variance & 95% projection intervals – Late booster, No new variant



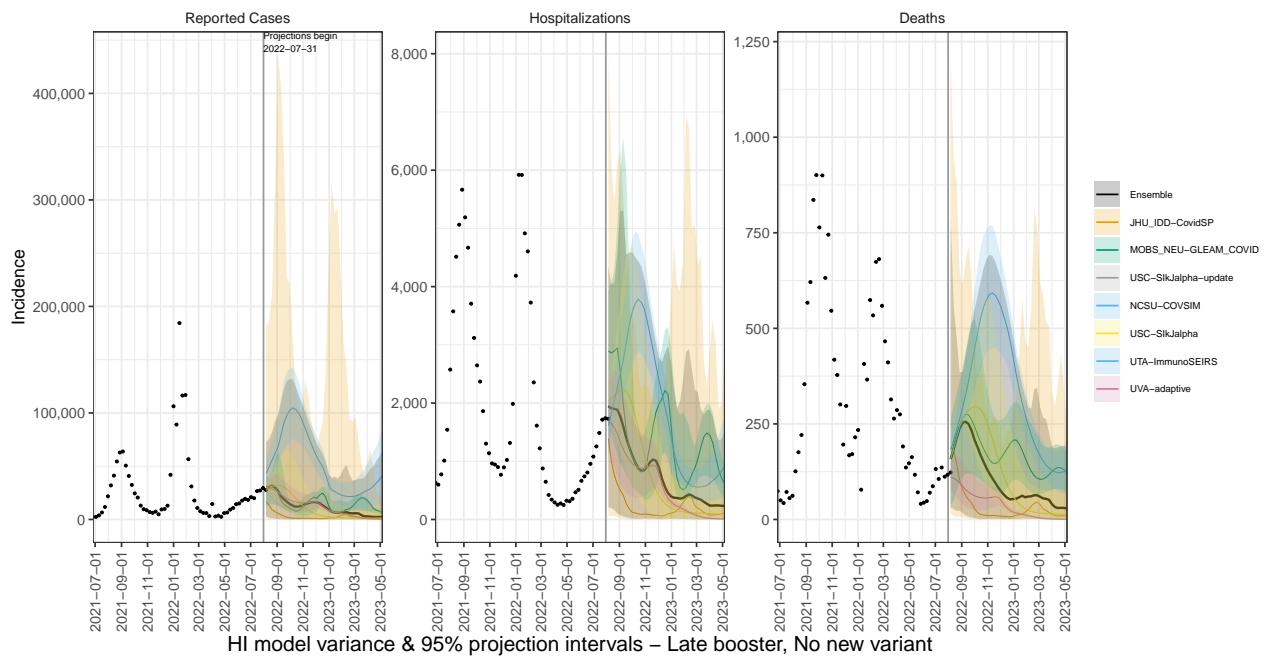
DC model variance & 95% projection intervals – Late booster, No new variant



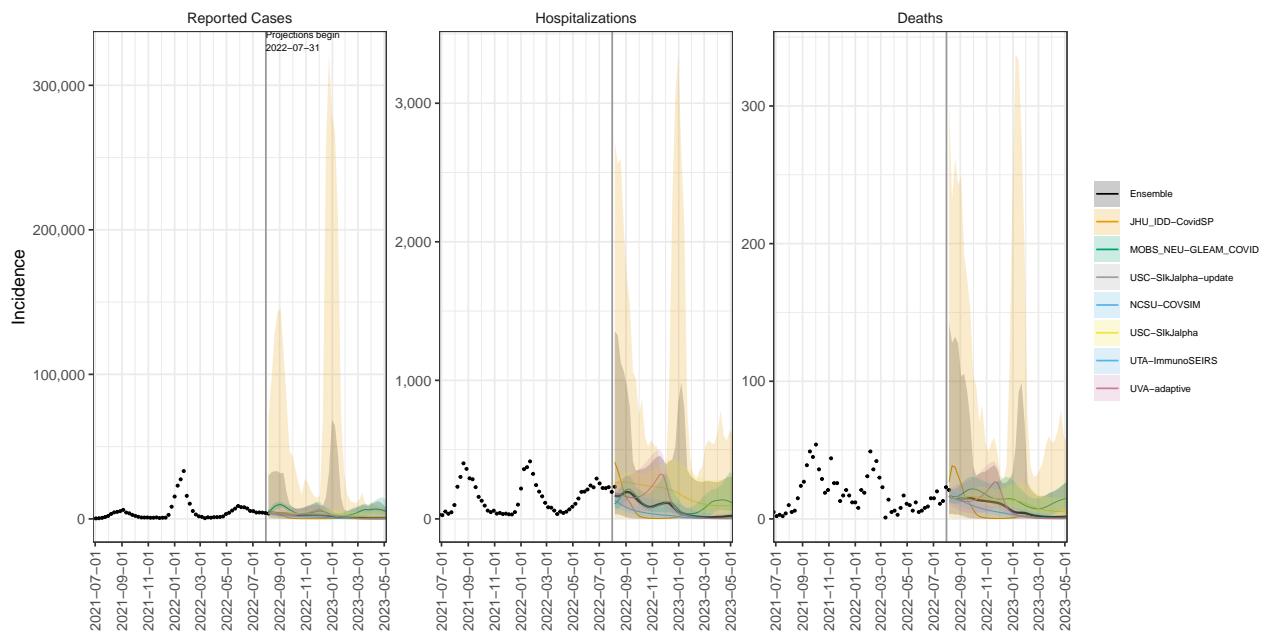
FL model variance & 95% projection intervals – Late booster, No new variant



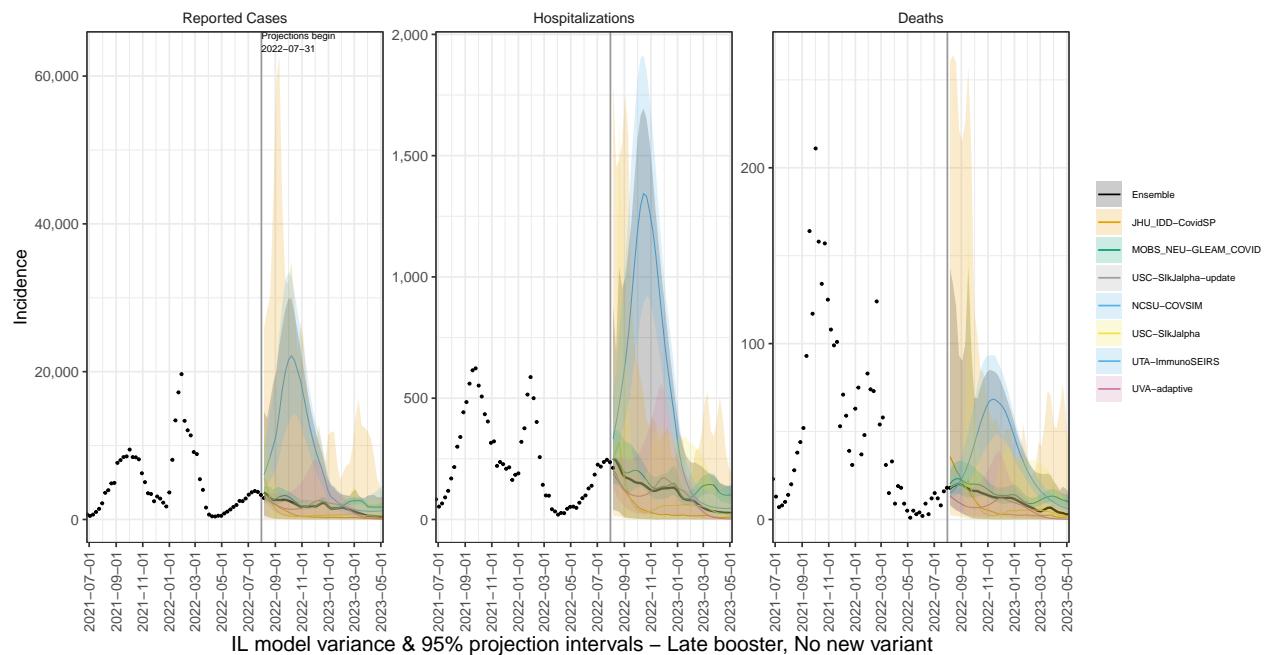
GA model variance & 95% projection intervals – Late booster, No new variant



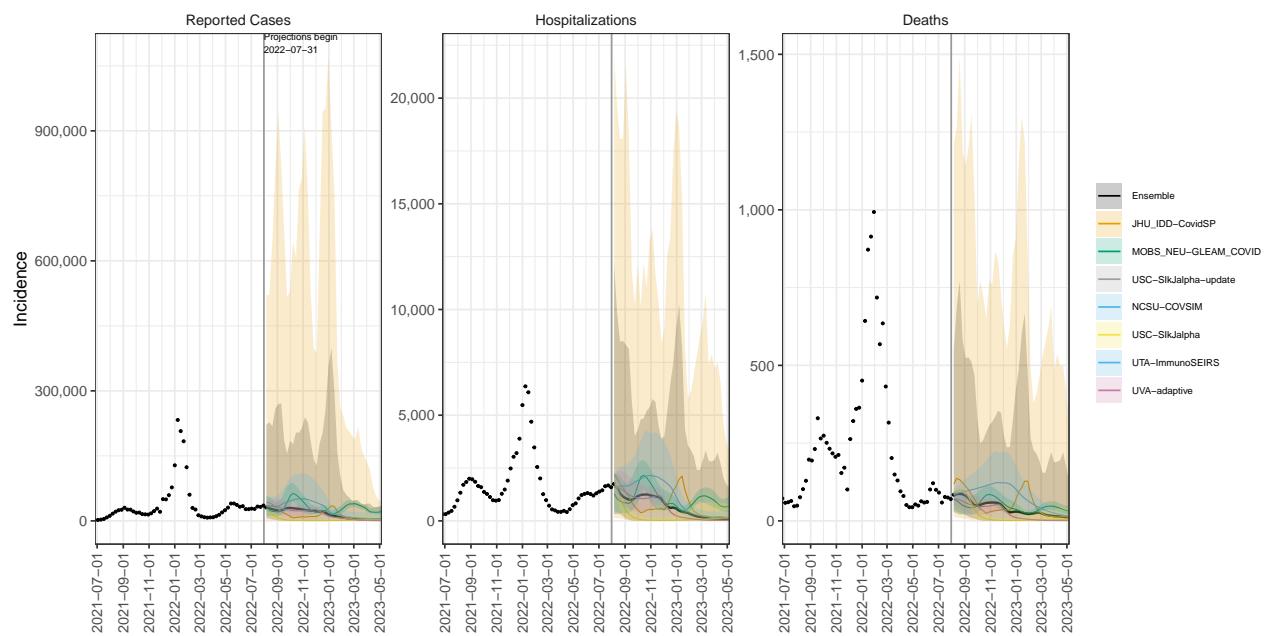
HI model variance & 95% projection intervals – Late booster, No new variant



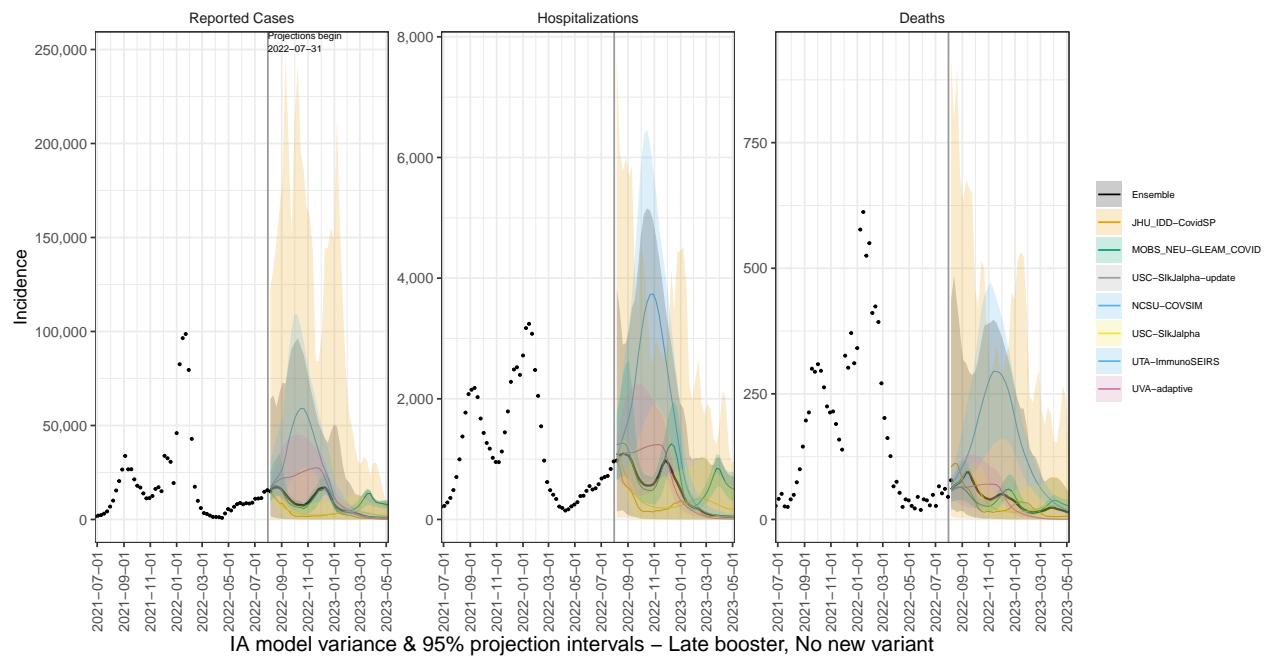
ID model variance & 95% projection intervals – Late booster, No new variant



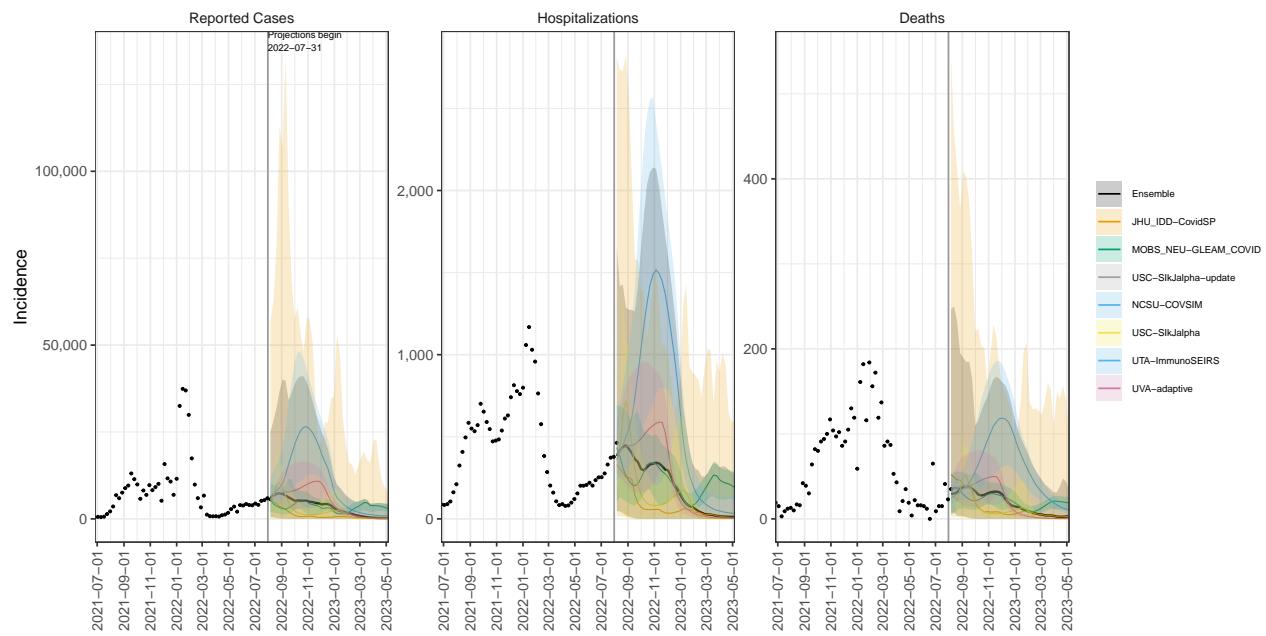
IL model variance & 95% projection intervals – Late booster, No new variant



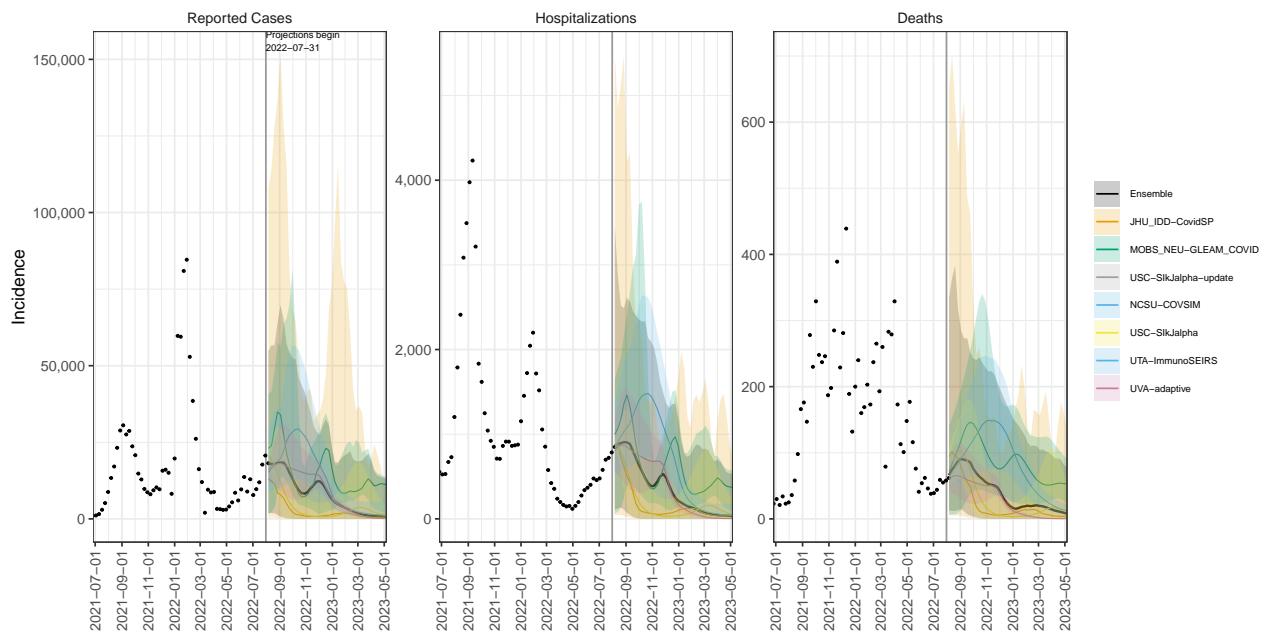
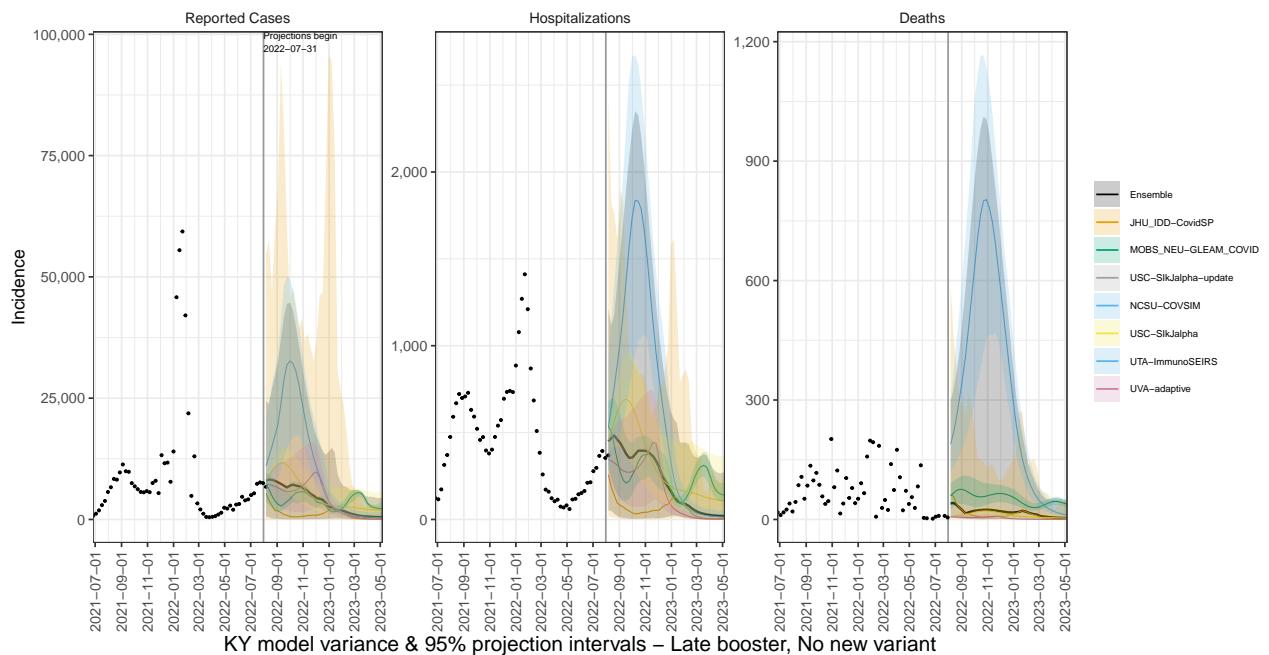
IN model variance & 95% projection intervals – Late booster, No new variant



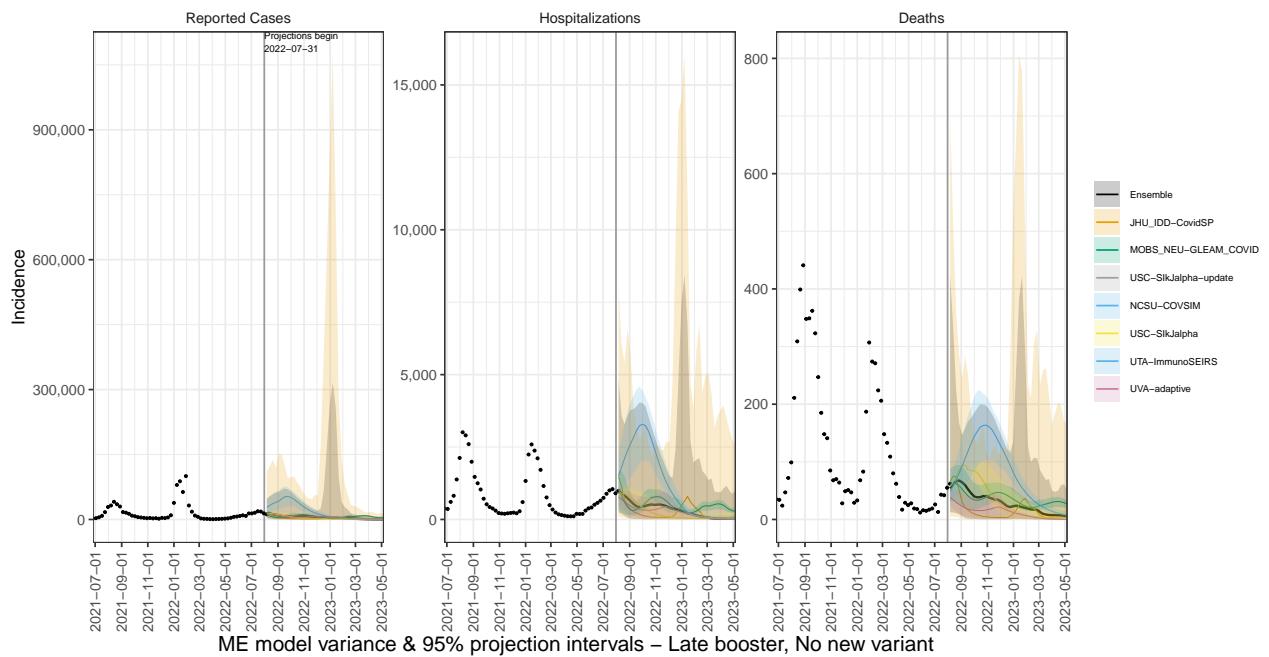
IA model variance & 95% projection intervals – Late booster, No new variant



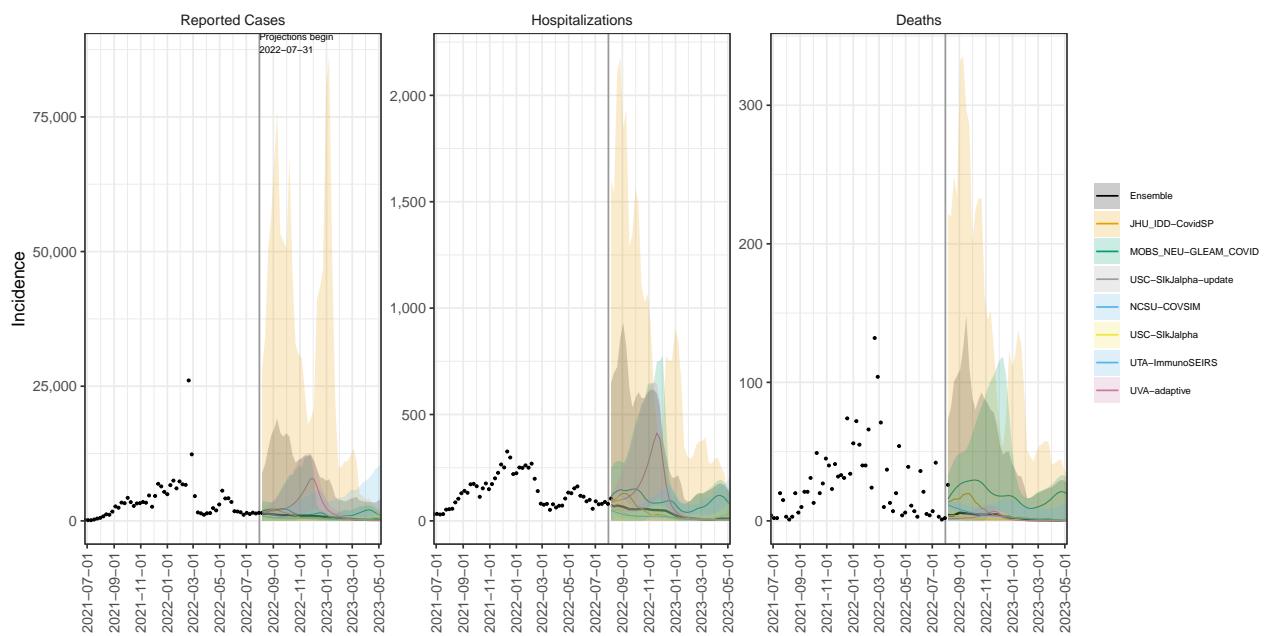
KS model variance & 95% projection intervals – Late booster, No new variant



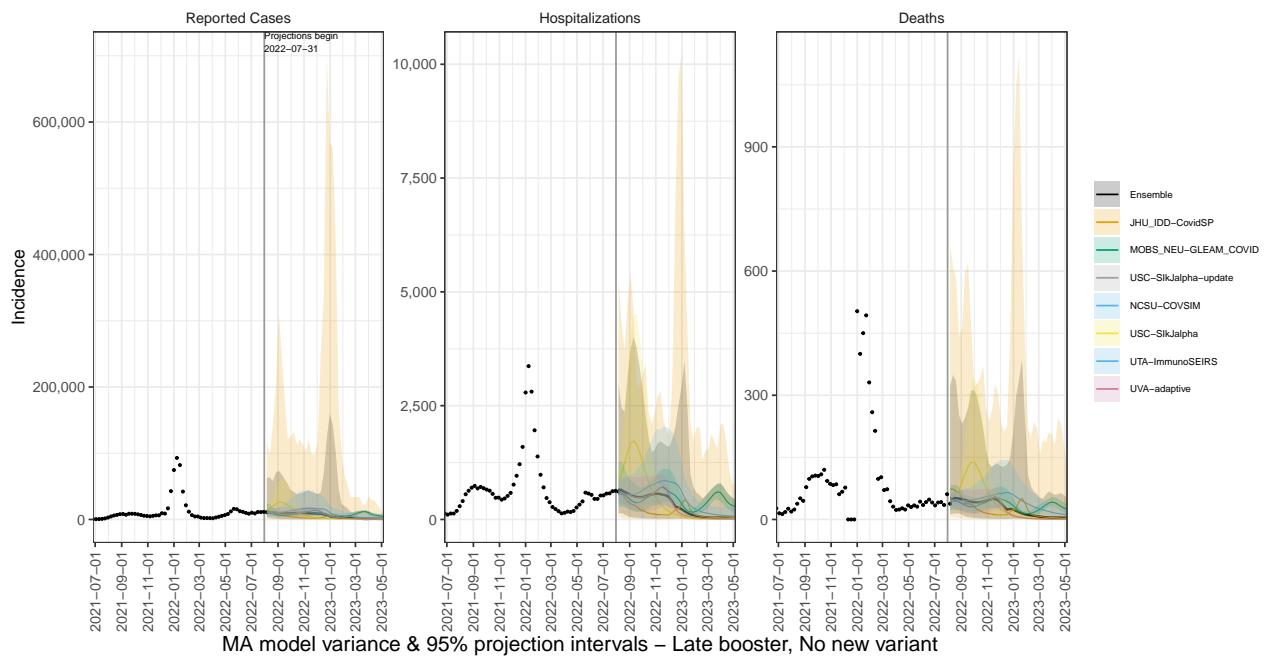
LA model variance & 95% projection intervals – Late booster, No new variant



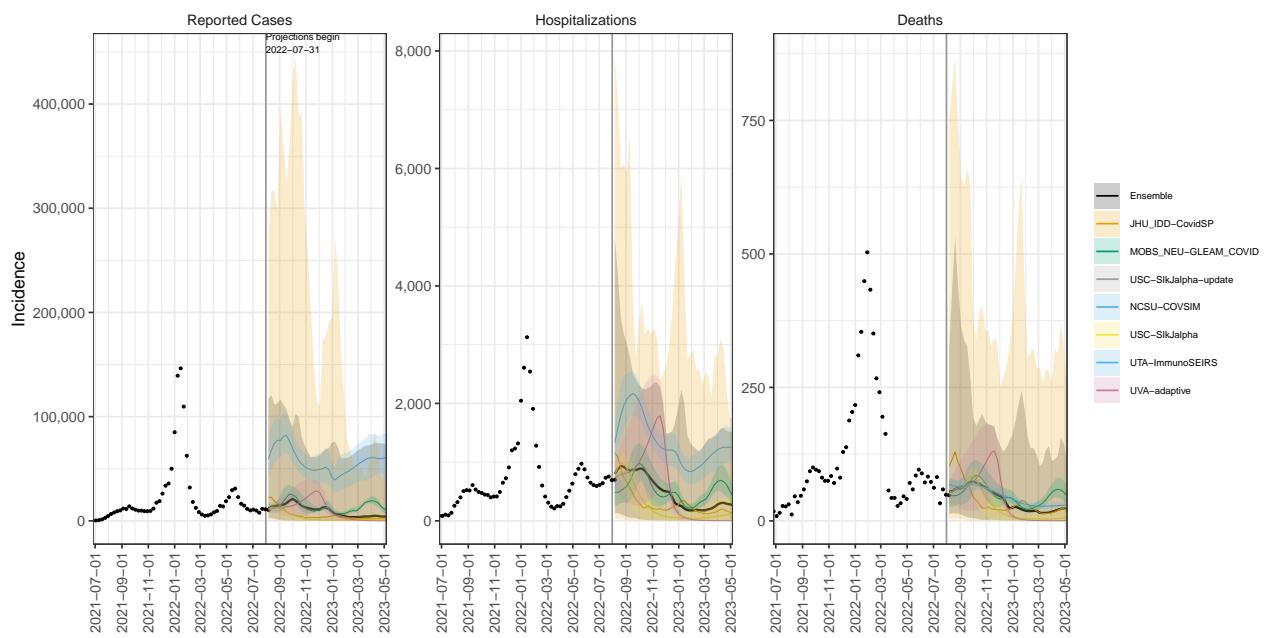
ME model variance & 95% projection intervals – Late booster, No new variant



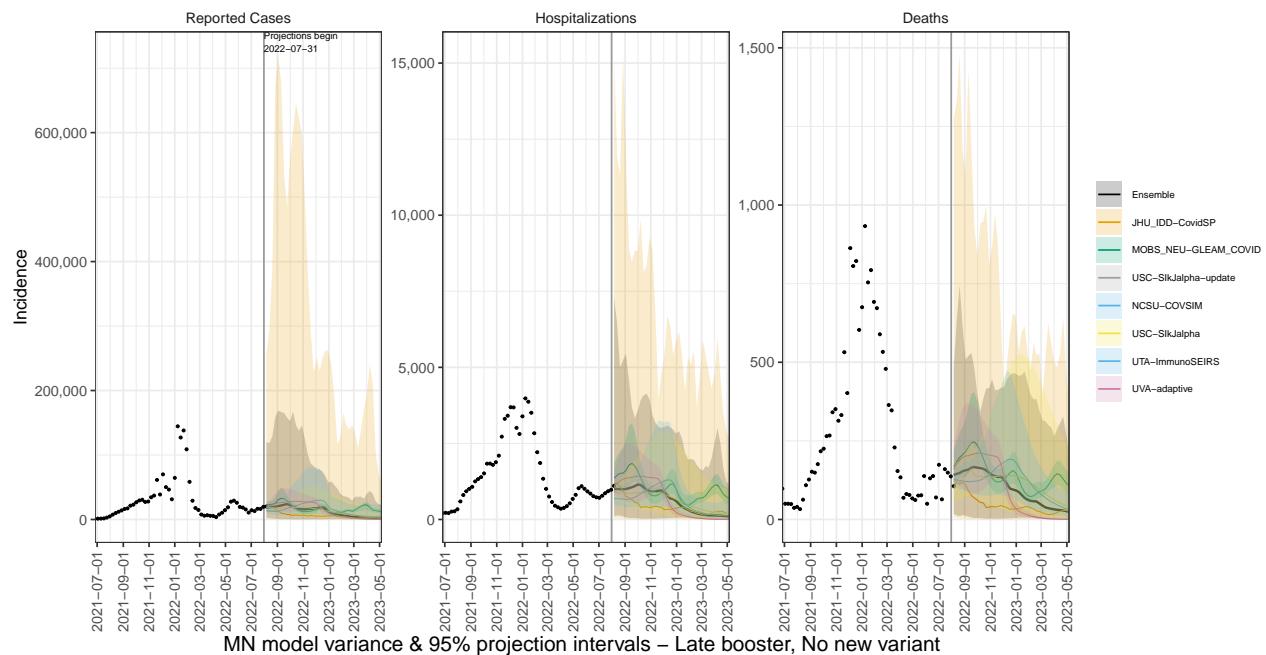
MD model variance & 95% projection intervals – Late booster, No new variant



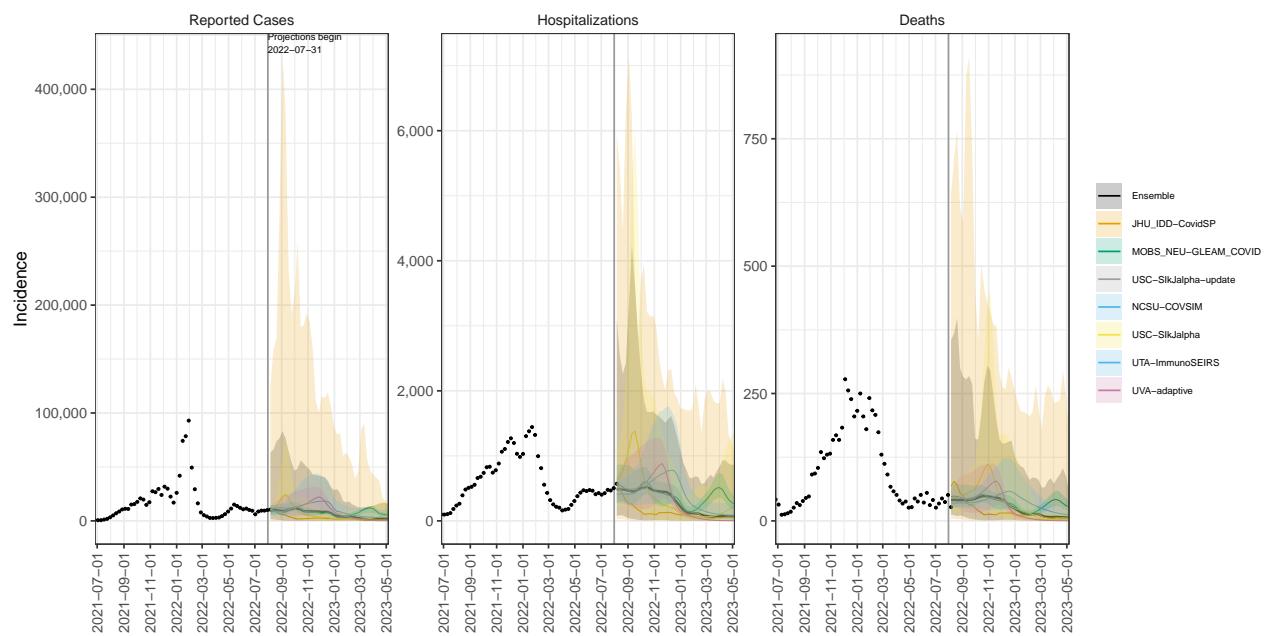
MA model variance & 95% projection intervals – Late booster, No new variant



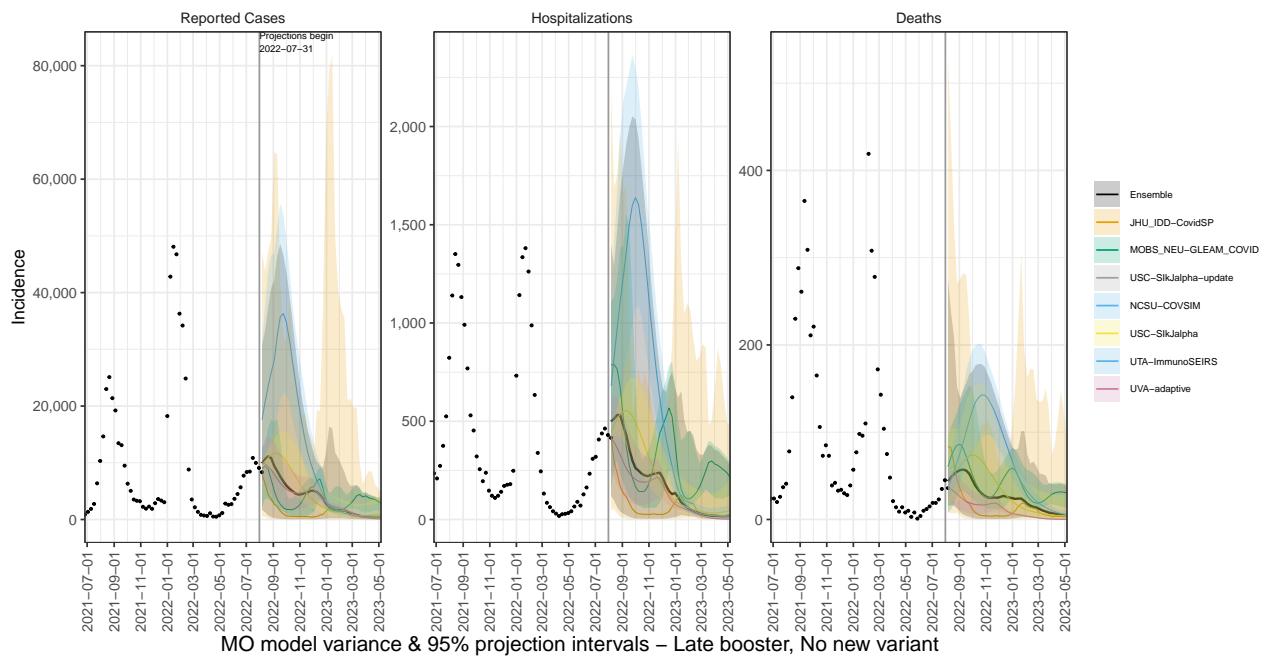
MI model variance & 95% projection intervals – Late booster, No new variant



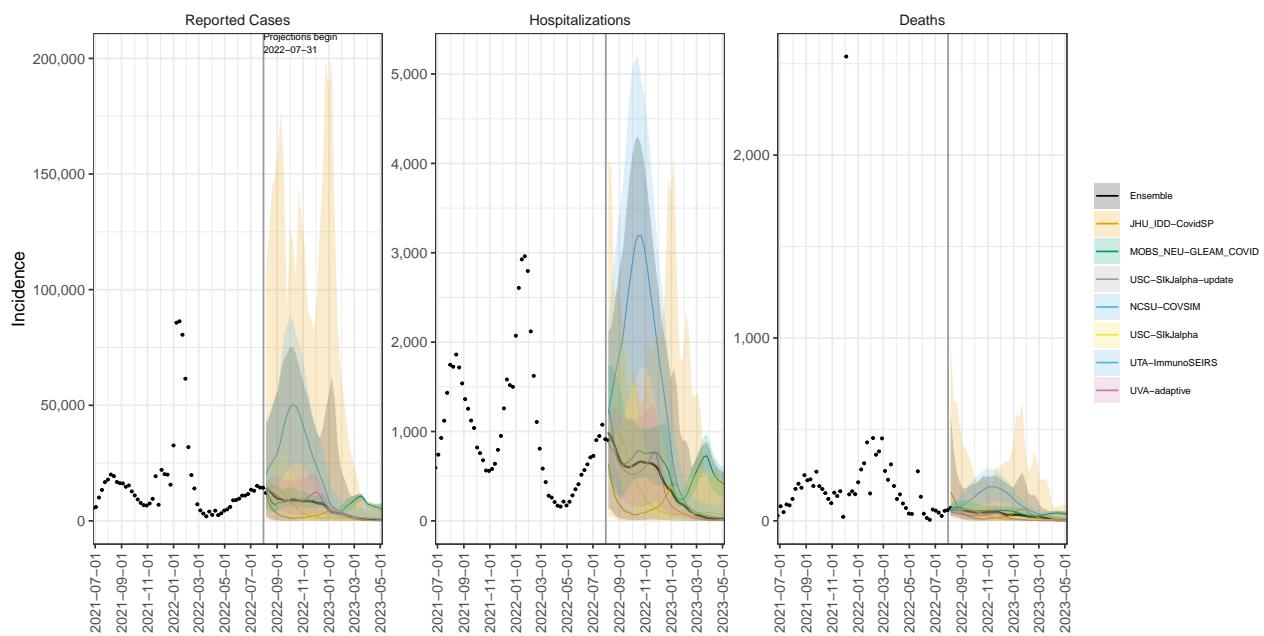
MN model variance & 95% projection intervals – Late booster, No new variant



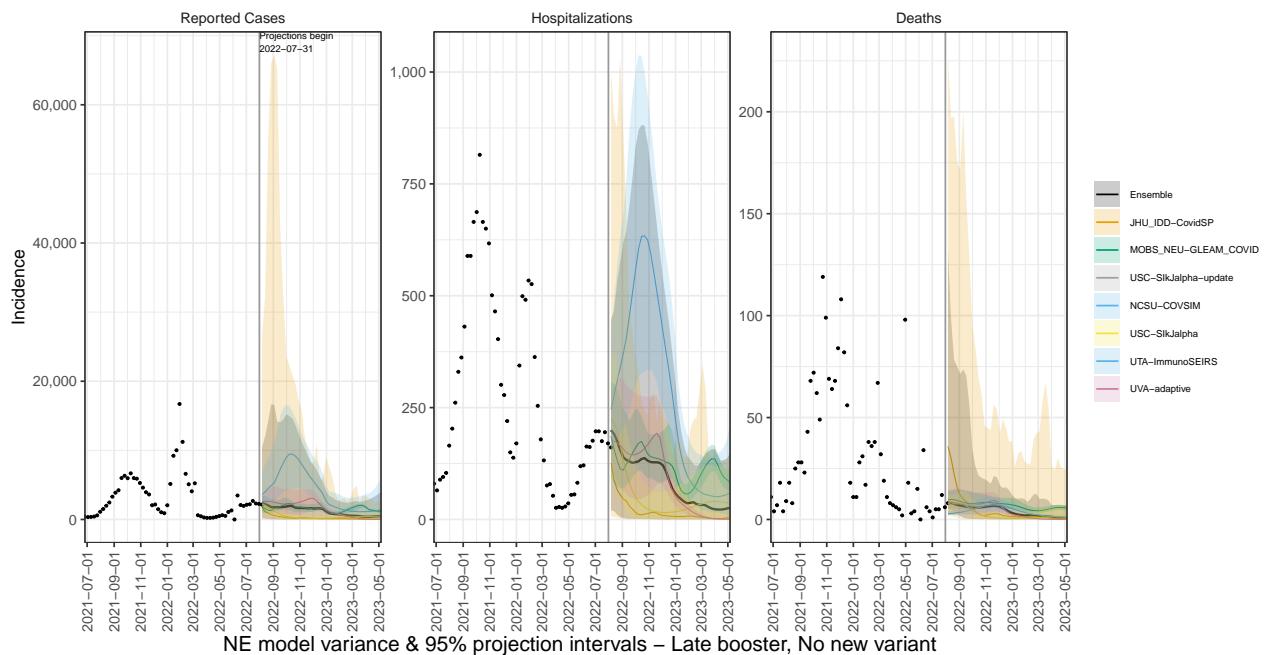
MS model variance & 95% projection intervals – Late booster, No new variant



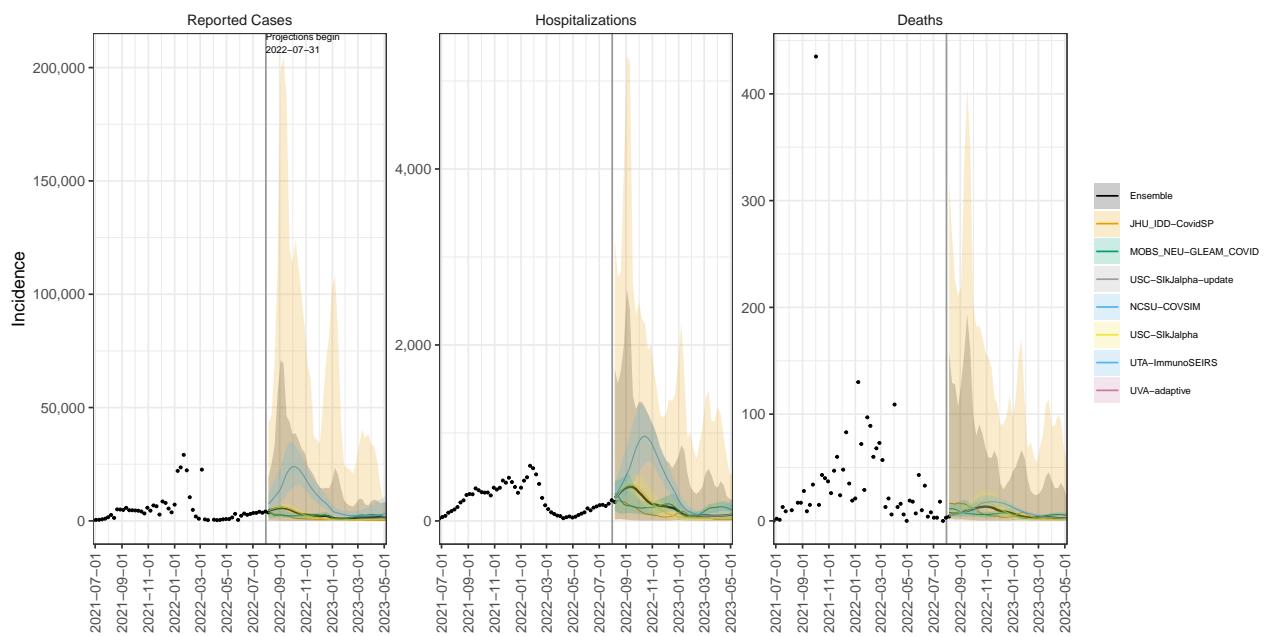
MO model variance & 95% projection intervals – Late booster, No new variant



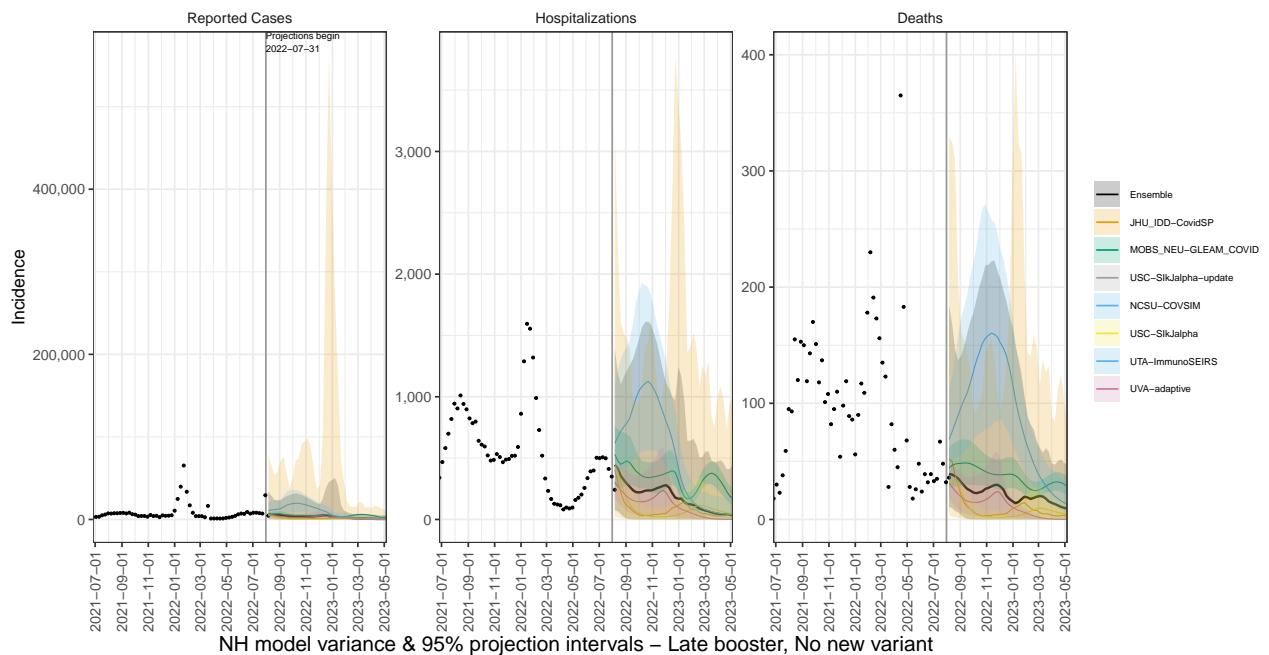
MT model variance & 95% projection intervals – Late booster, No new variant



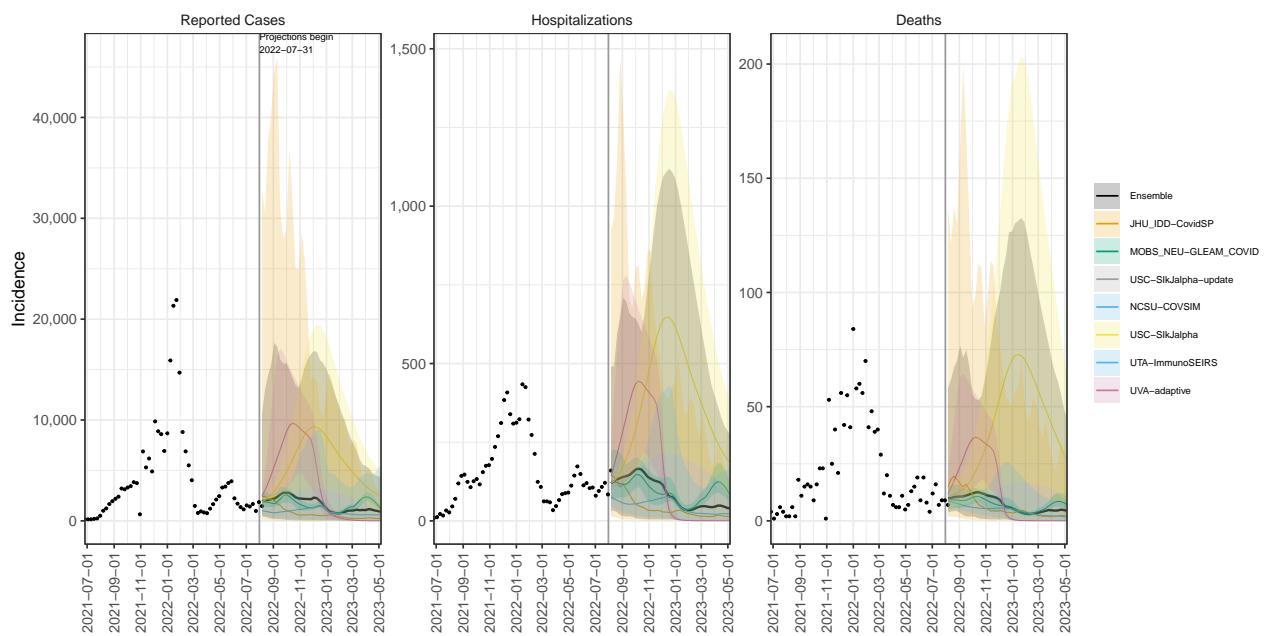
NE model variance & 95% projection intervals – Late booster, No new variant



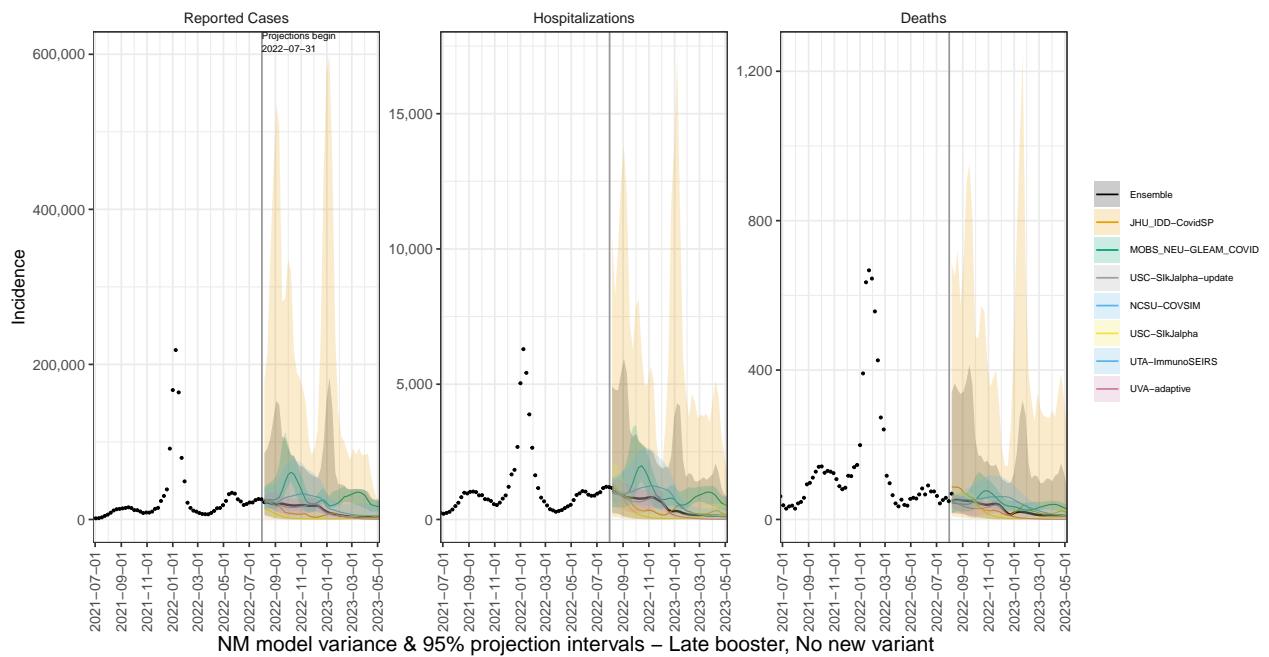
NV model variance & 95% projection intervals – Late booster, No new variant



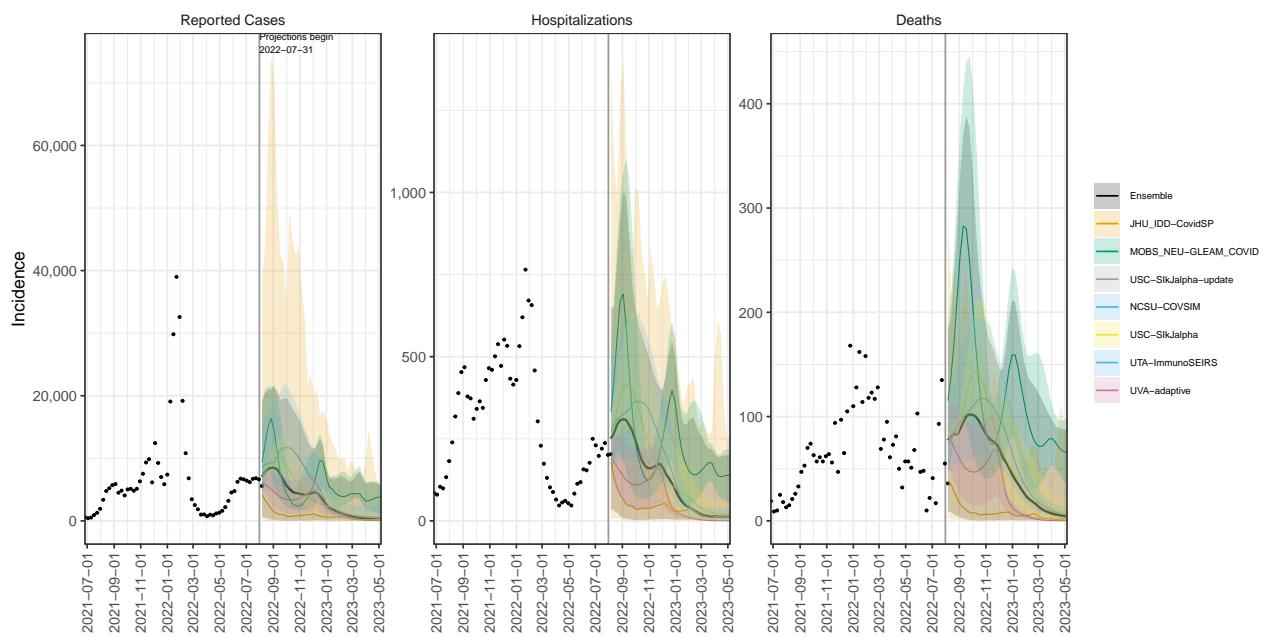
NH model variance & 95% projection intervals – Late booster, No new variant



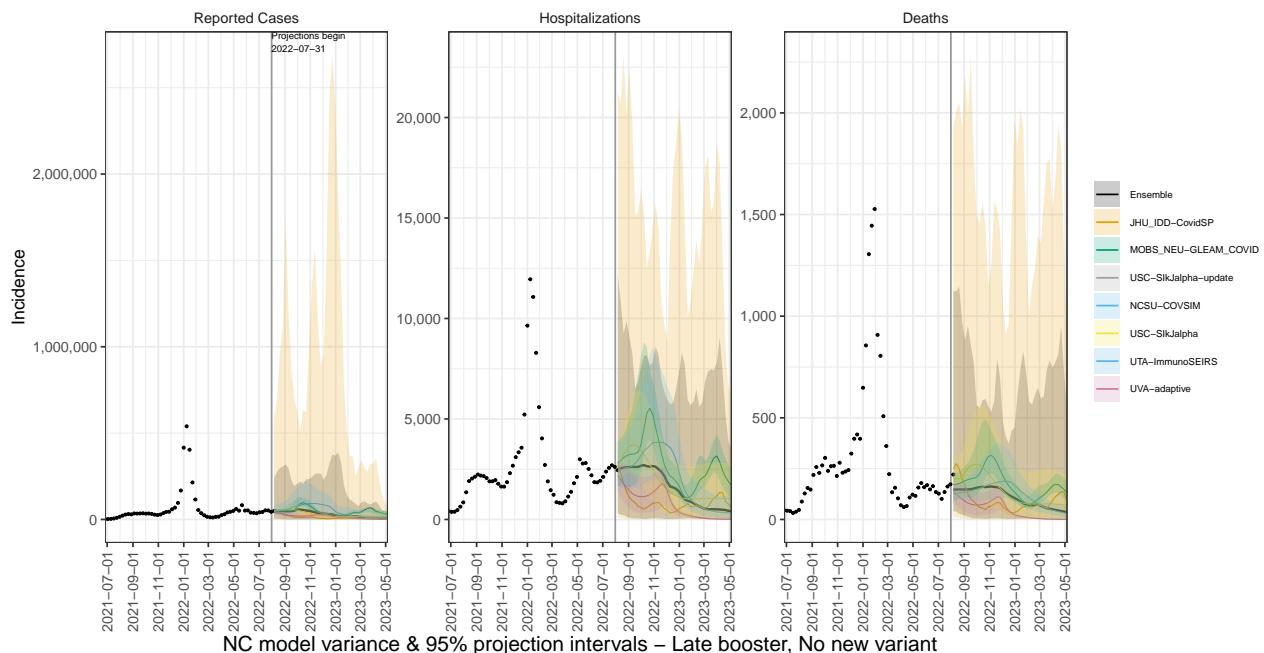
NJ model variance & 95% projection intervals – Late booster, No new variant



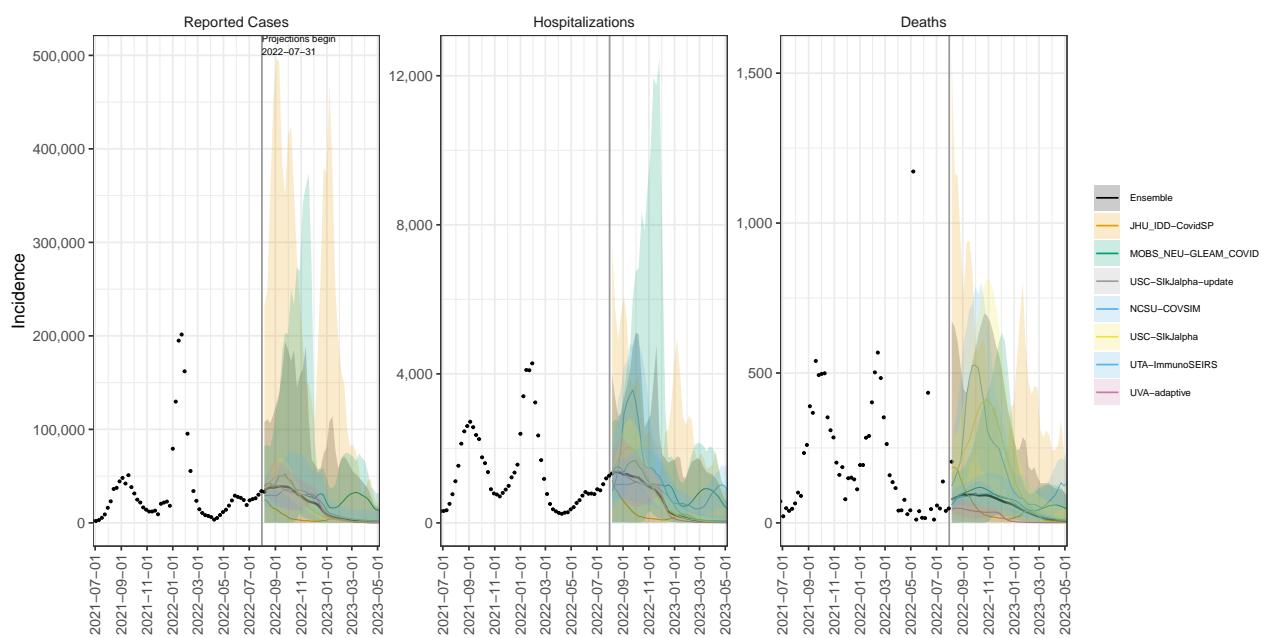
NM model variance & 95% projection intervals – Late booster, No new variant



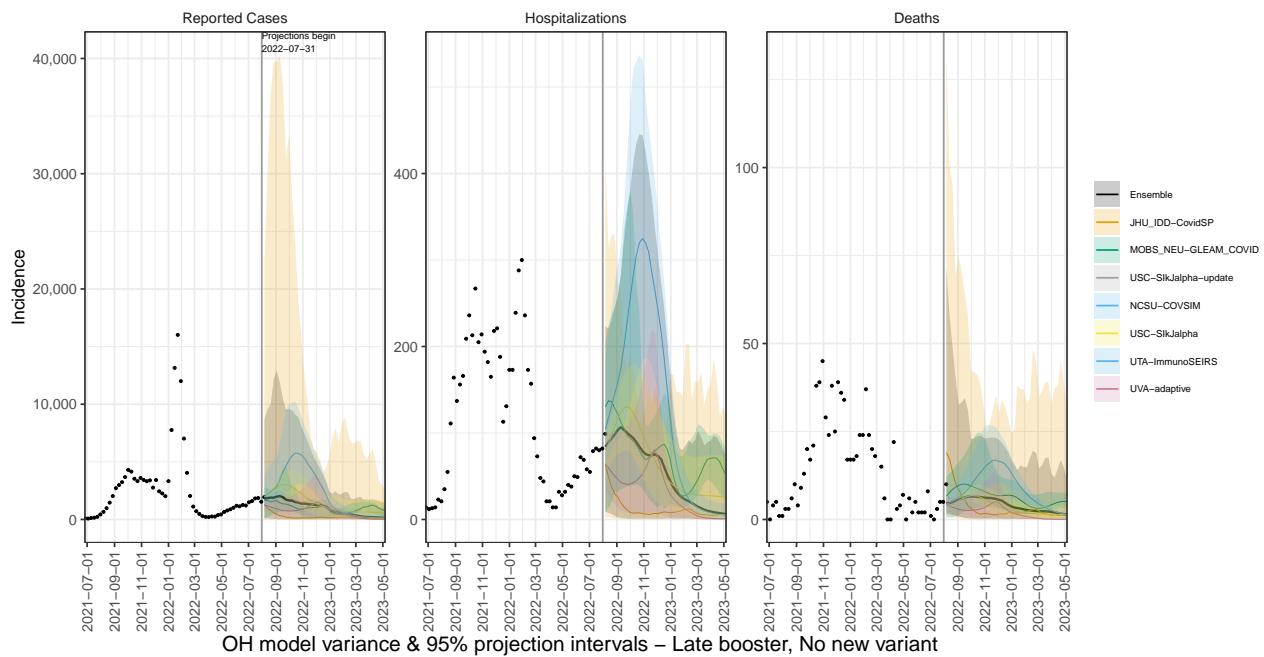
NY model variance & 95% projection intervals – Late booster, No new variant



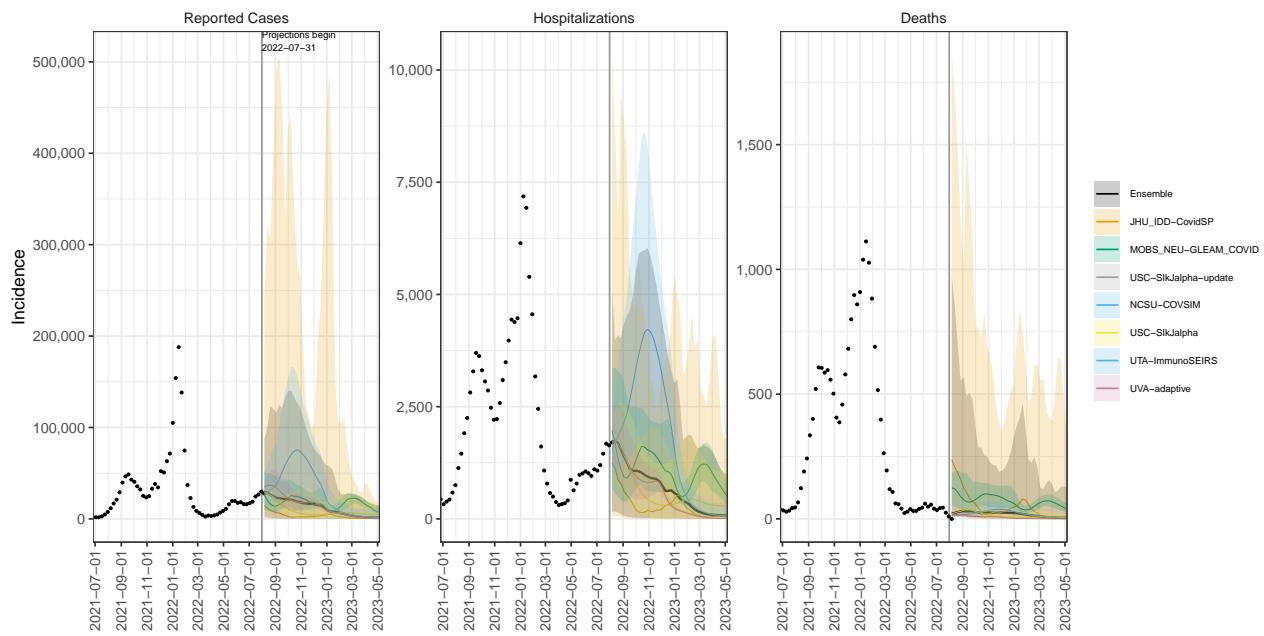
NC model variance & 95% projection intervals – Late booster, No new variant



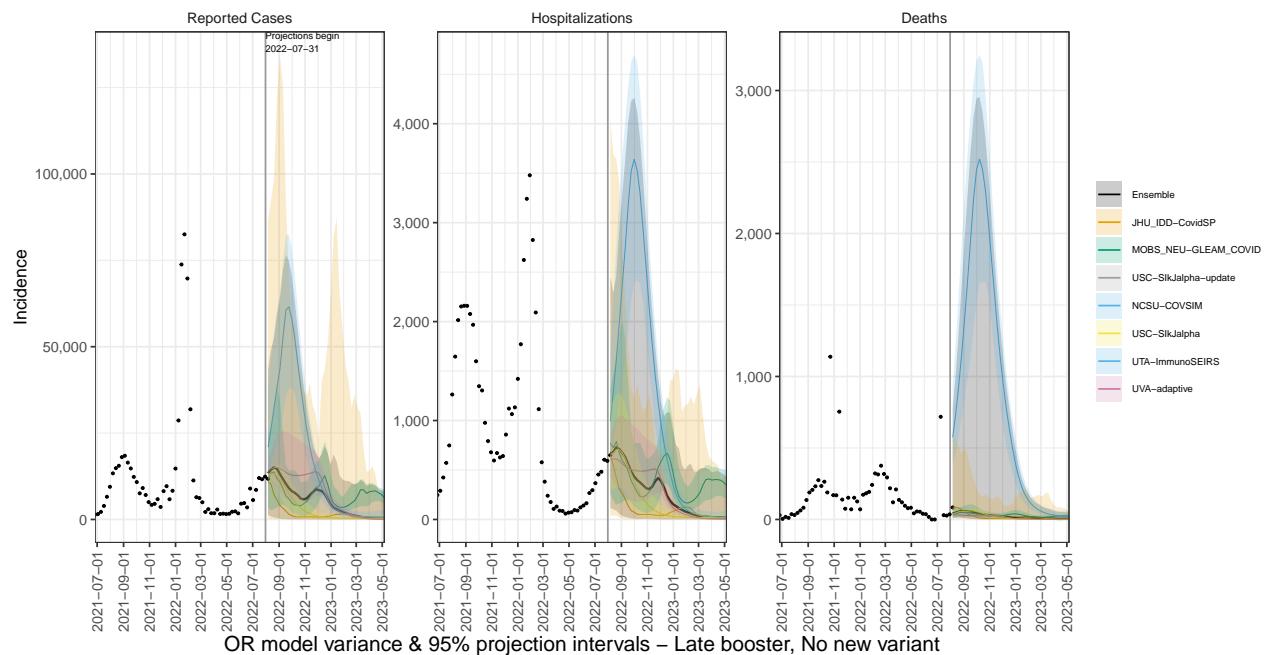
ND model variance & 95% projection intervals – Late booster, No new variant



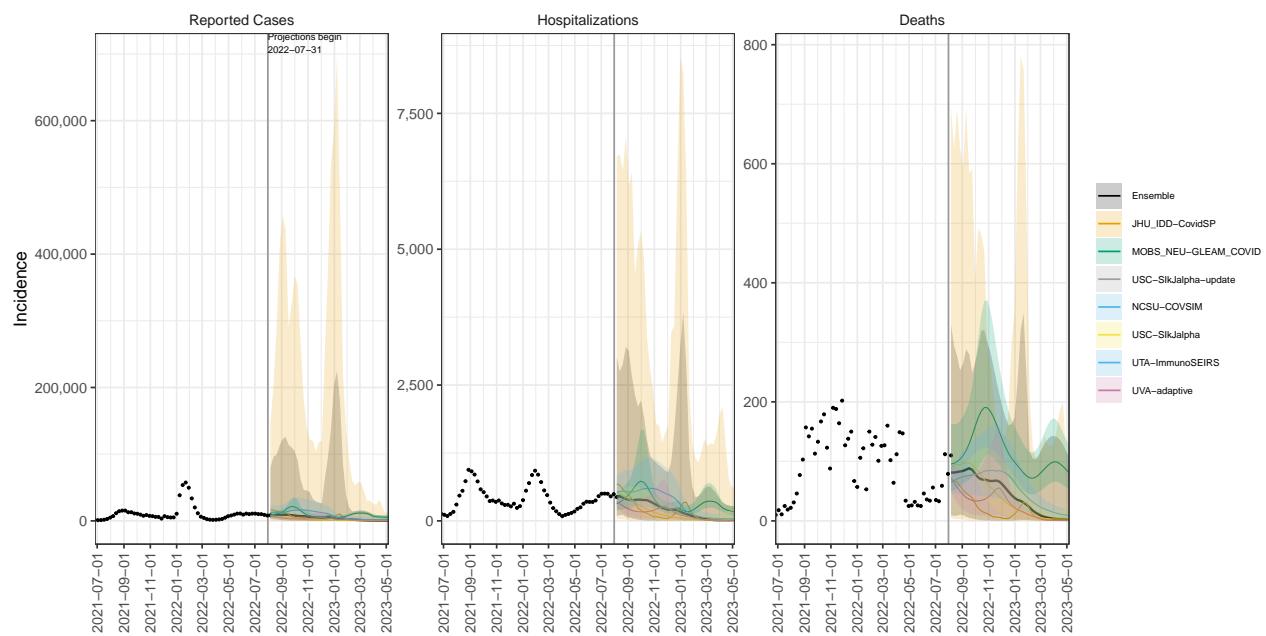
OH model variance & 95% projection intervals – Late booster, No new variant



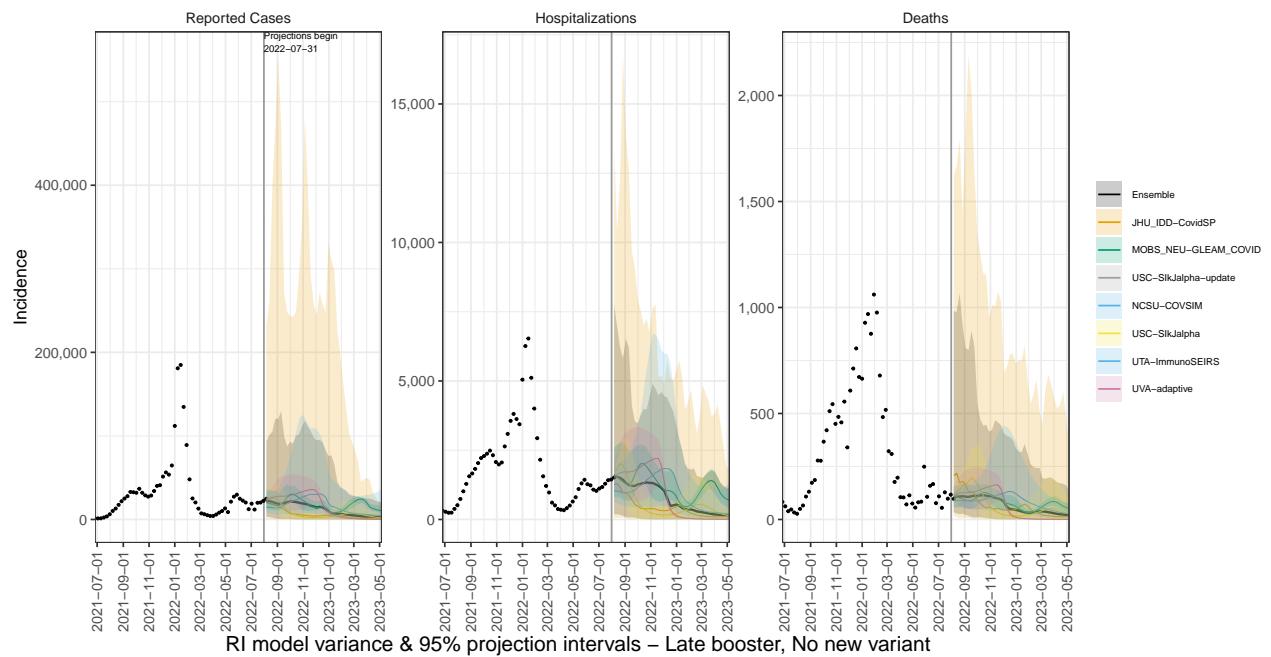
OK model variance & 95% projection intervals – Late booster, No new variant



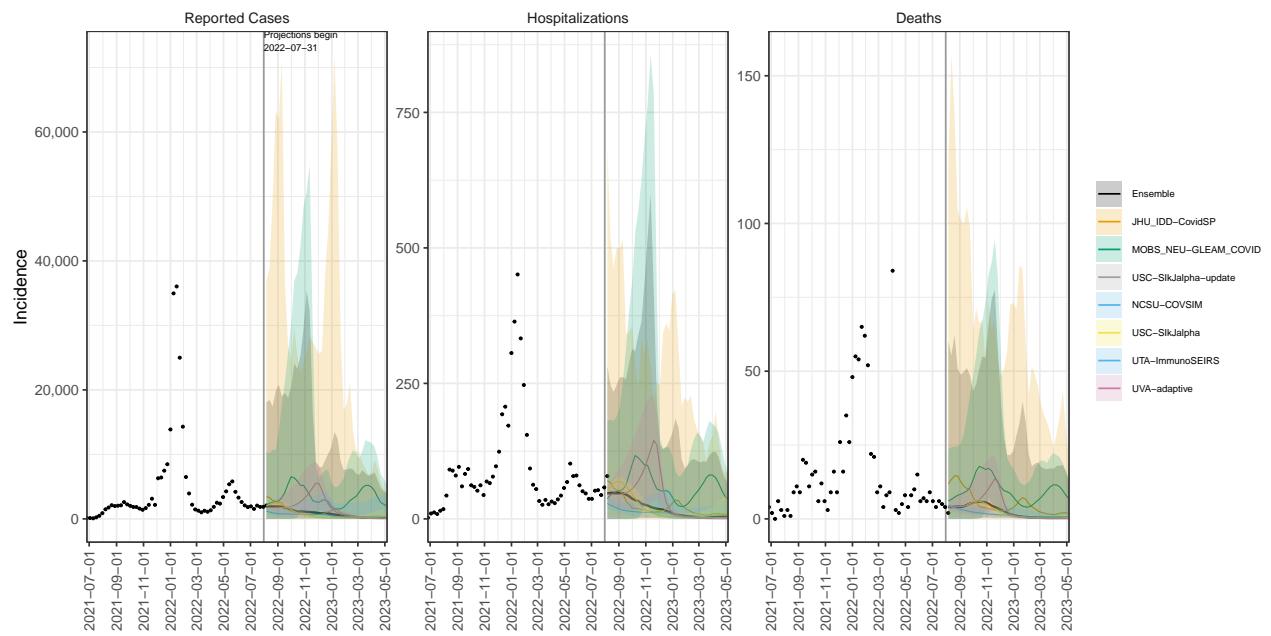
OR model variance & 95% projection intervals – Late booster, No new variant



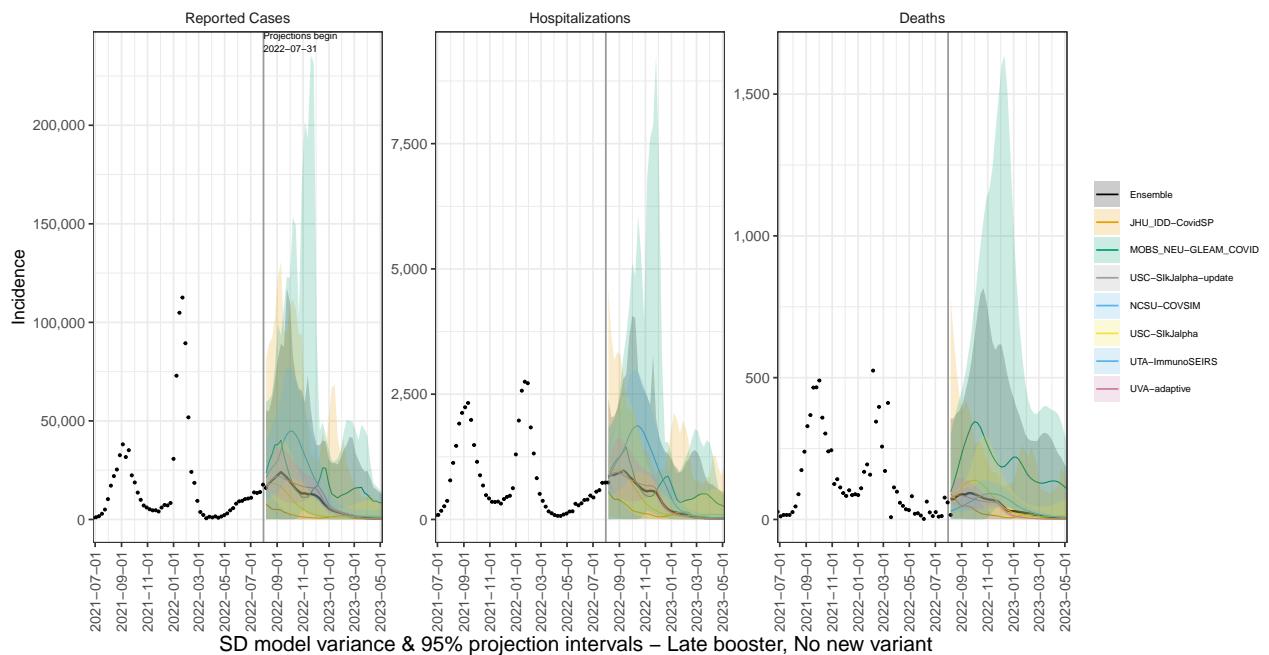
PA model variance & 95% projection intervals – Late booster, No new variant



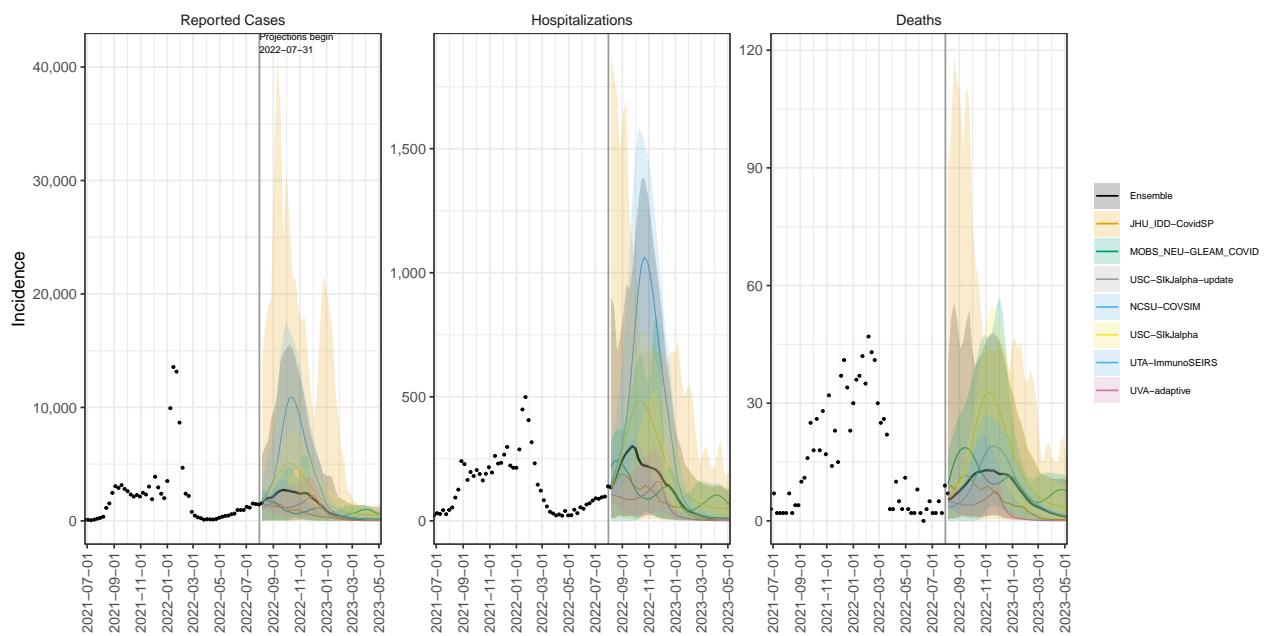
RI model variance & 95% projection intervals – Late booster, No new variant



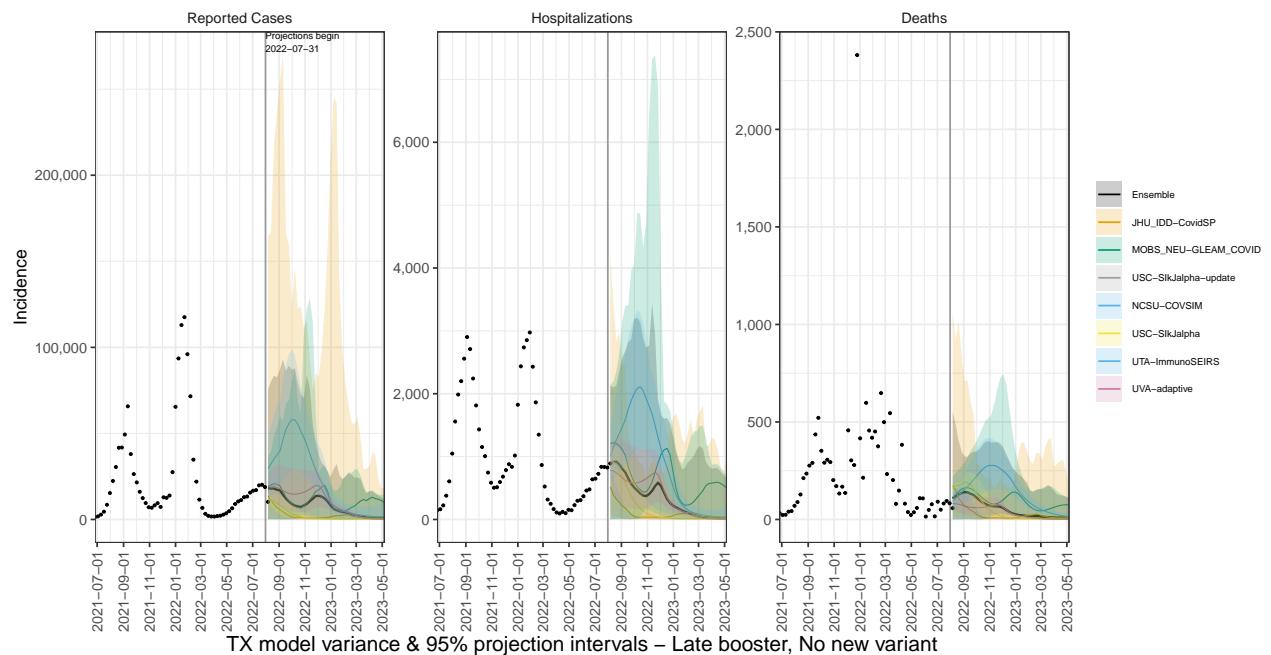
SC model variance & 95% projection intervals – Late booster, No new variant



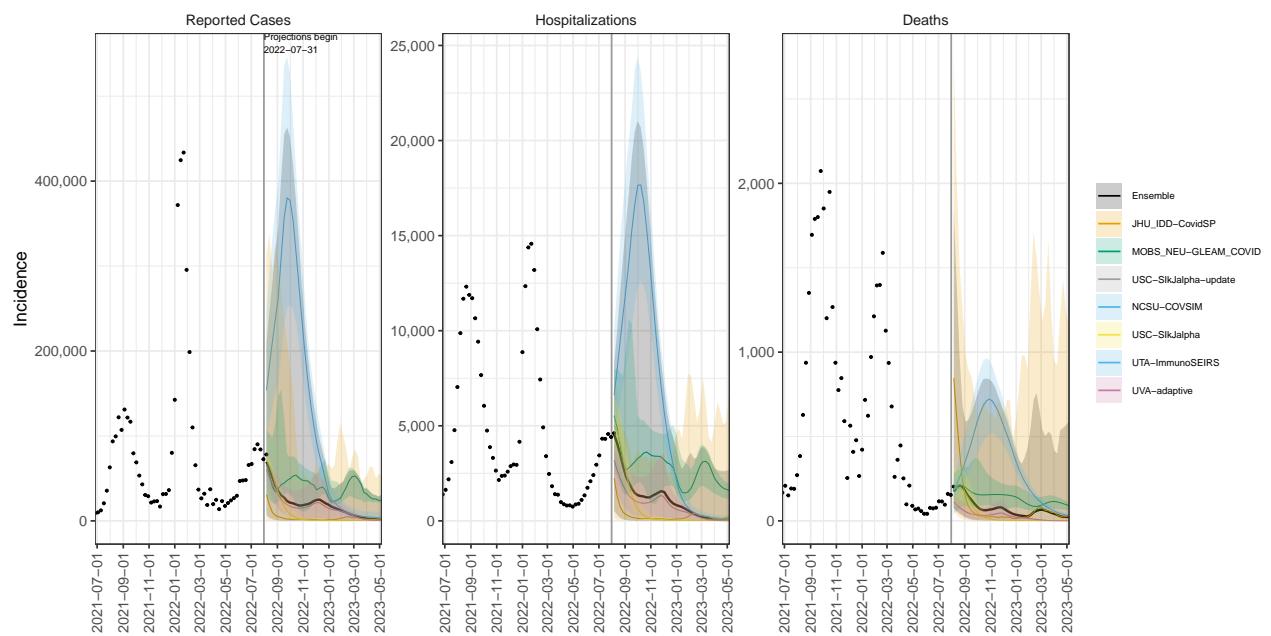
SD model variance & 95% projection intervals – Late booster, No new variant



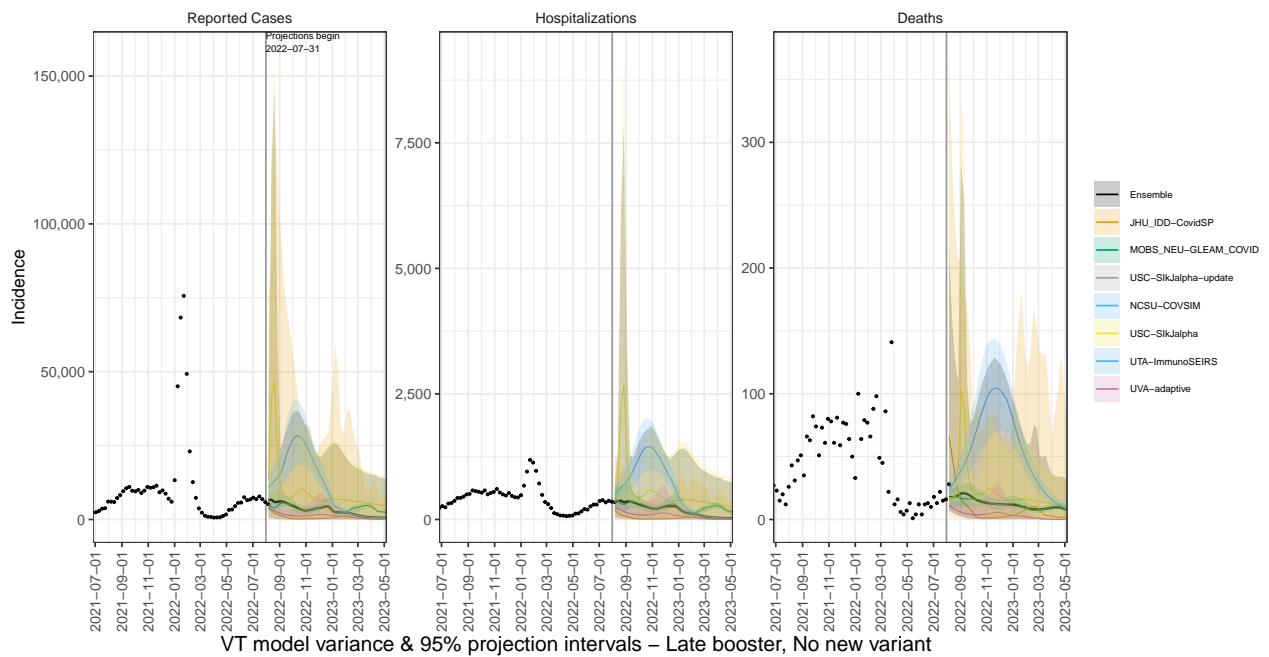
TN model variance & 95% projection intervals – Late booster, No new variant



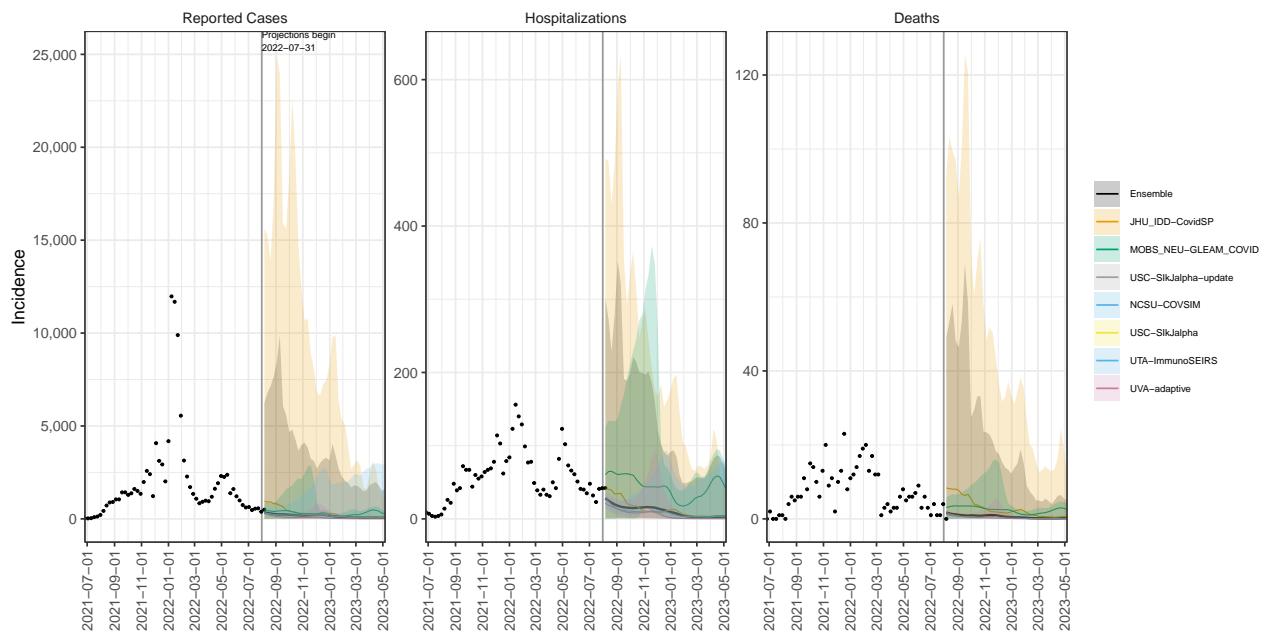
TX model variance & 95% projection intervals – Late booster, No new variant



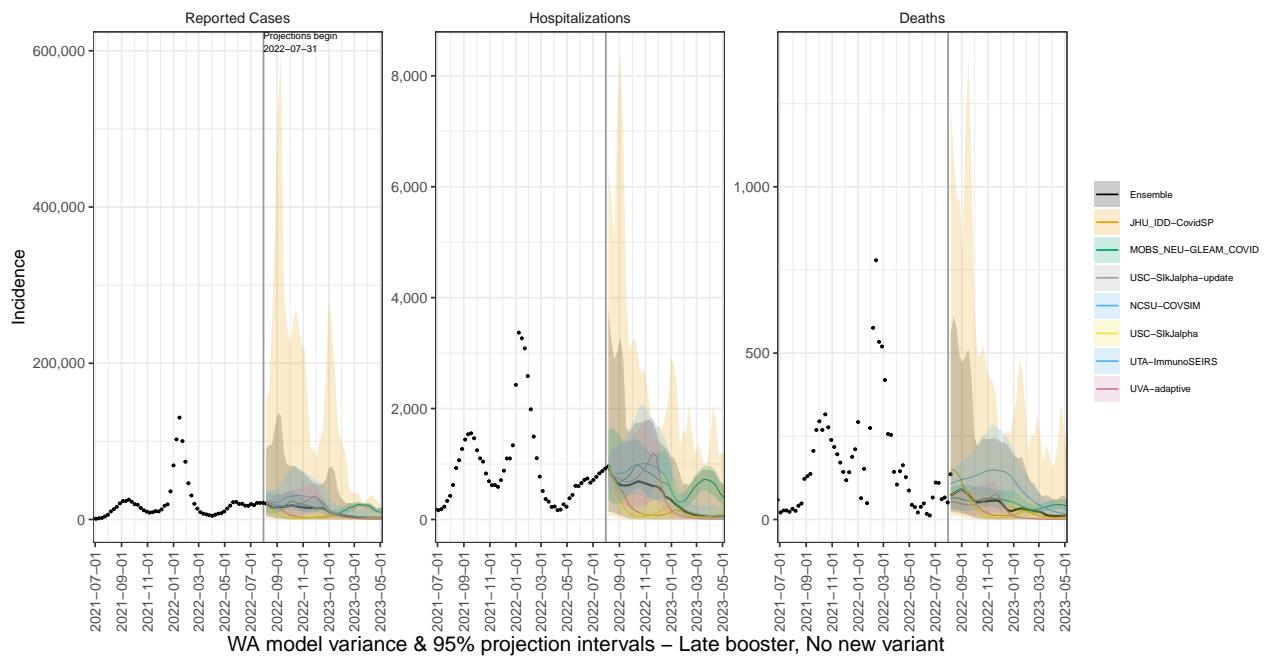
UT model variance & 95% projection intervals – Late booster, No new variant



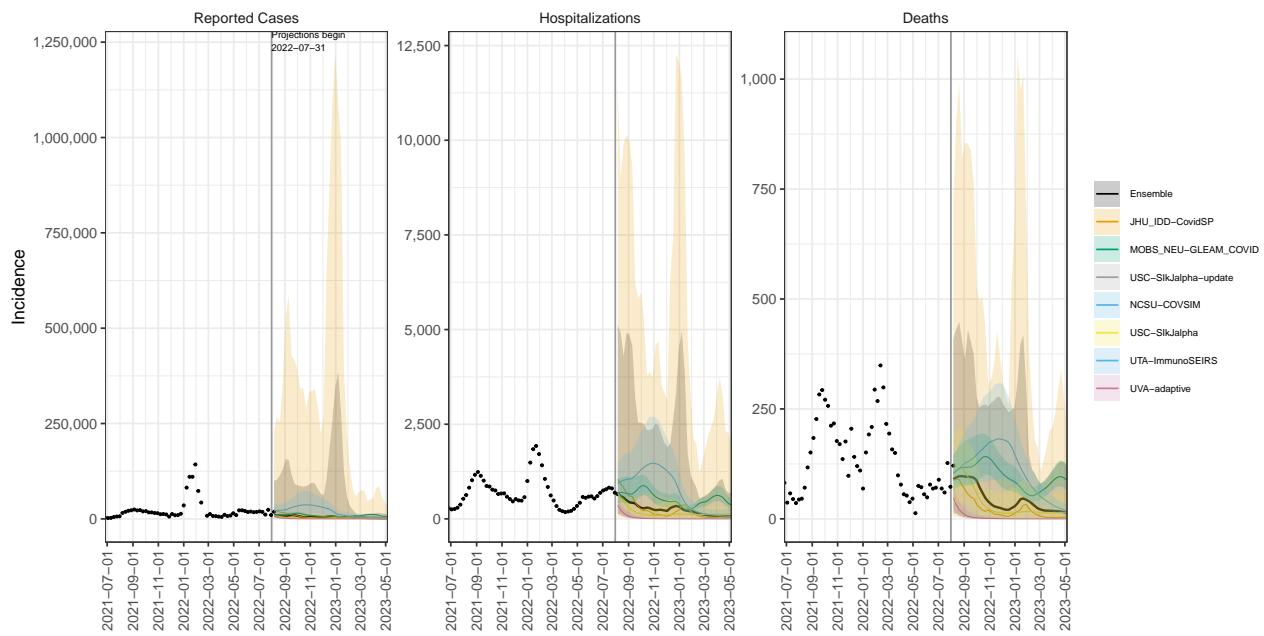
VT model variance & 95% projection intervals – Late booster, No new variant



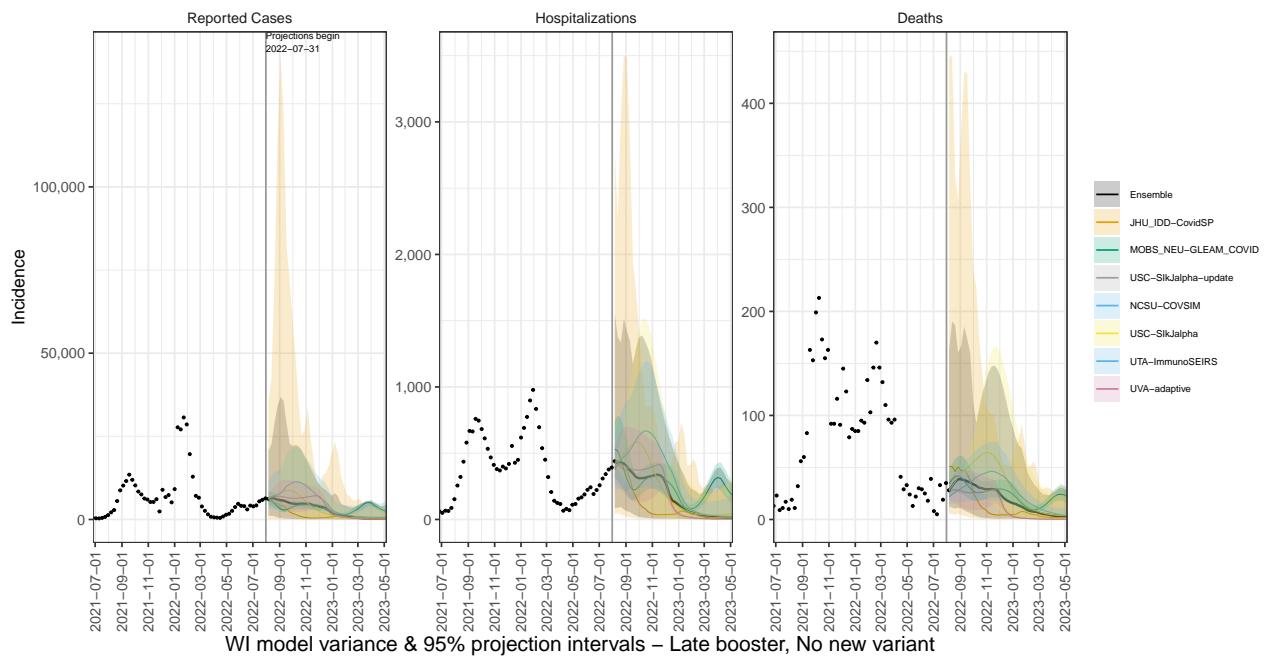
VA model variance & 95% projection intervals – Late booster, No new variant



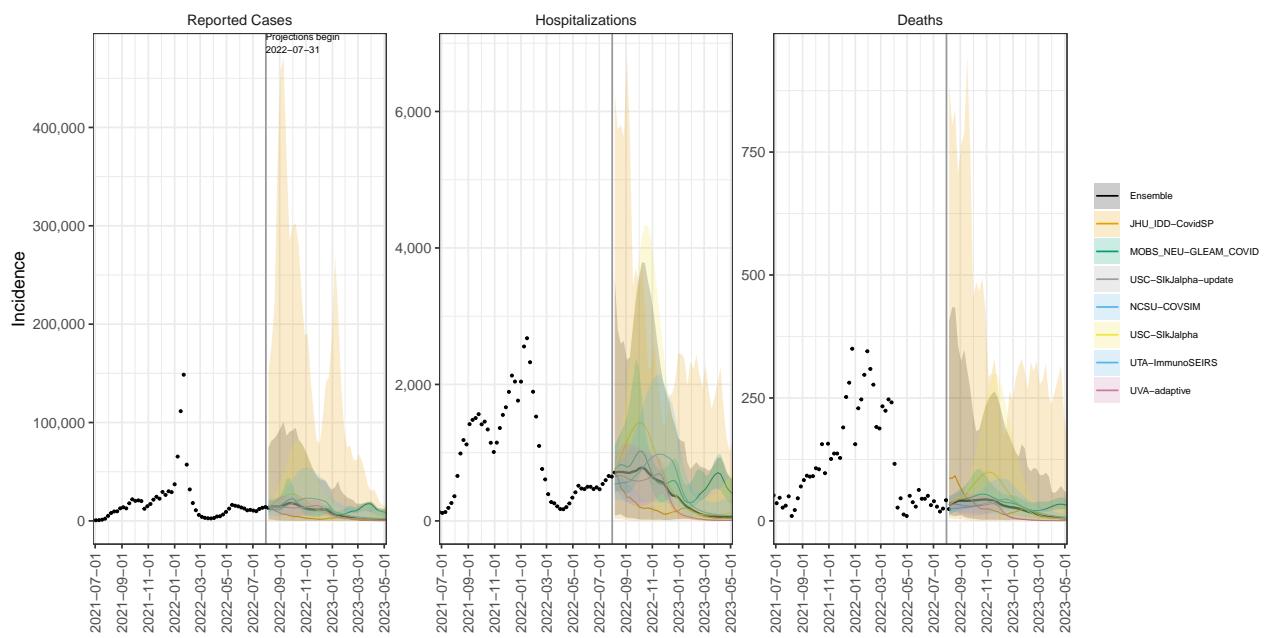
WA model variance & 95% projection intervals – Late booster, No new variant



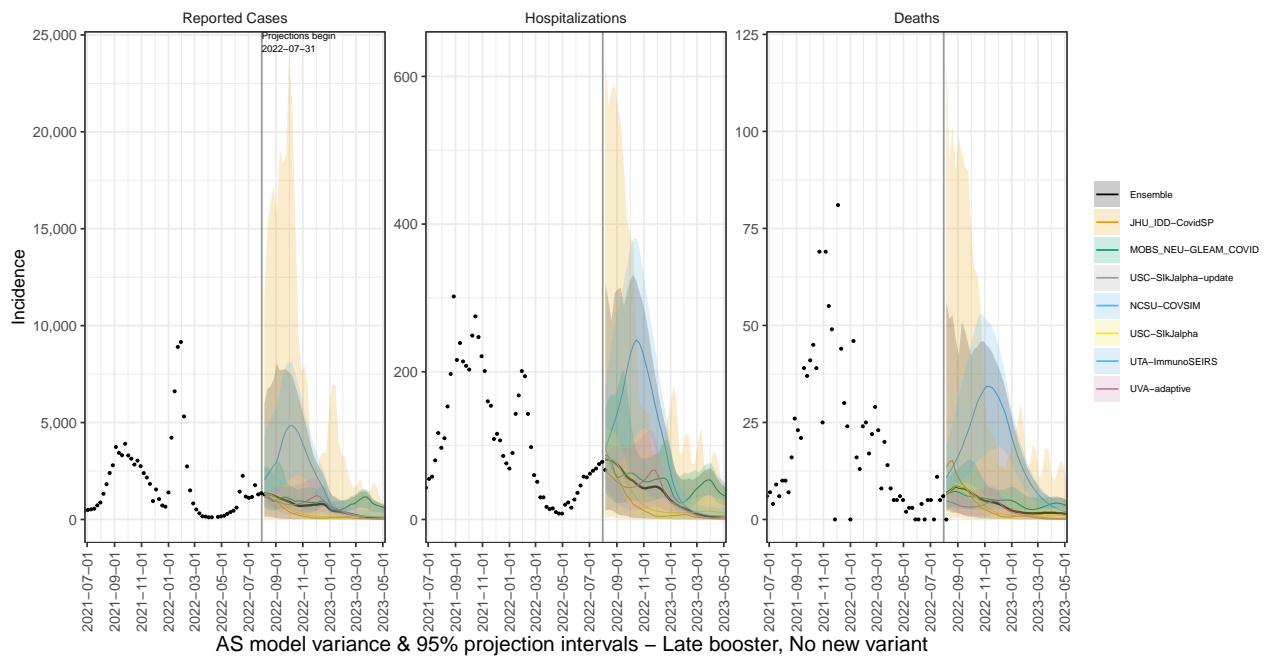
WV model variance & 95% projection intervals – Late booster, No new variant



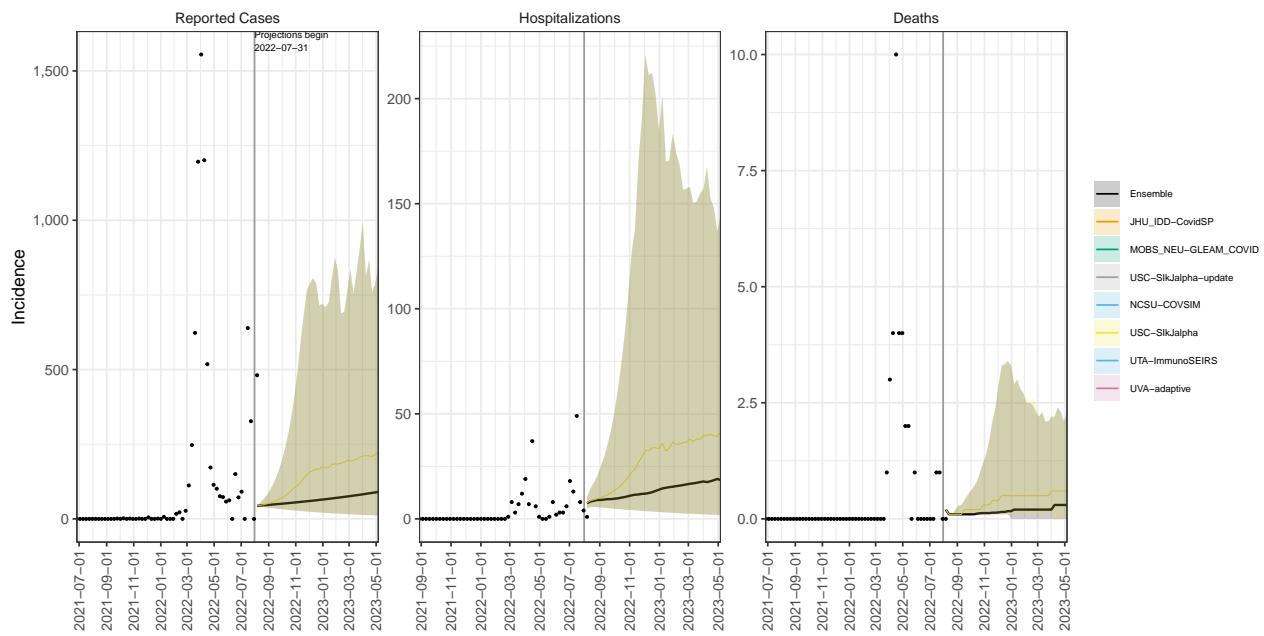
WI model variance & 95% projection intervals – Late booster, No new variant



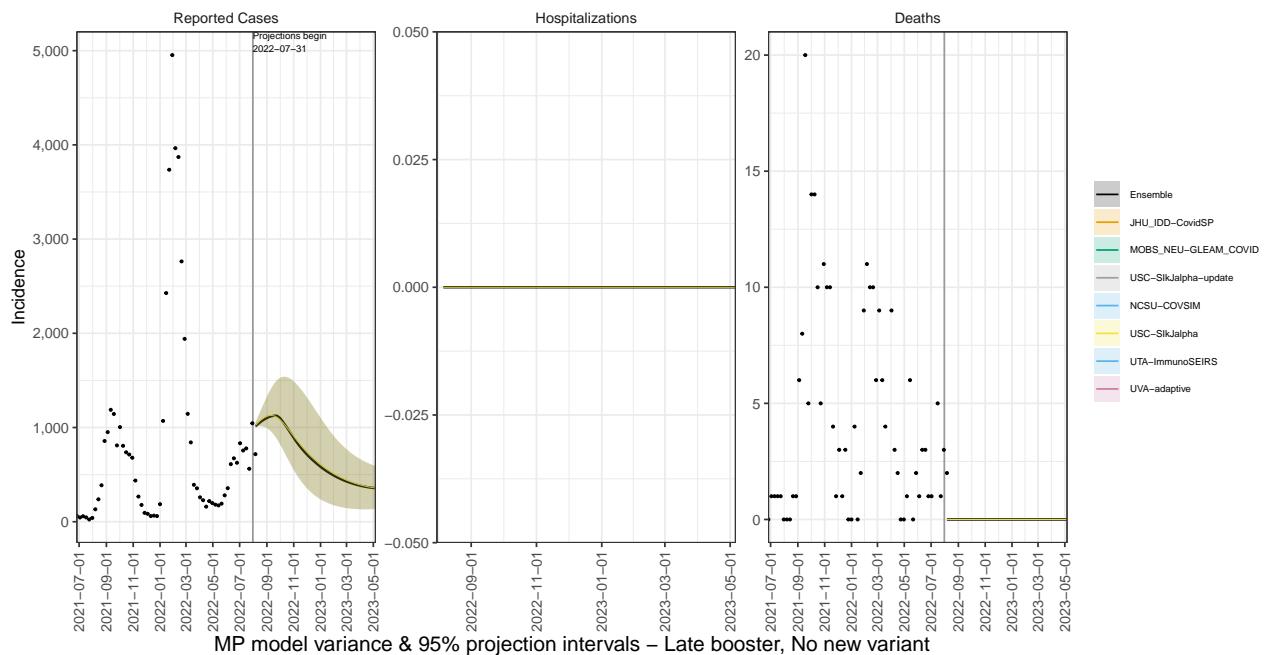
WY model variance & 95% projection intervals – Late booster, No new variant



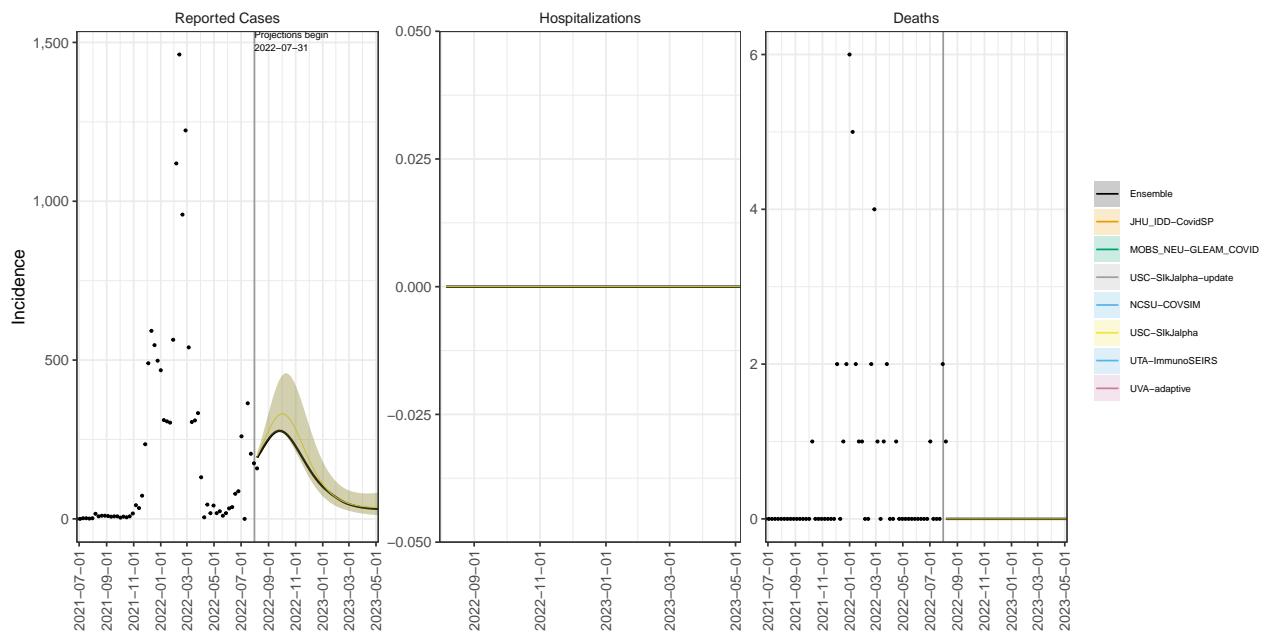
AS model variance & 95% projection intervals – Late booster, No new variant



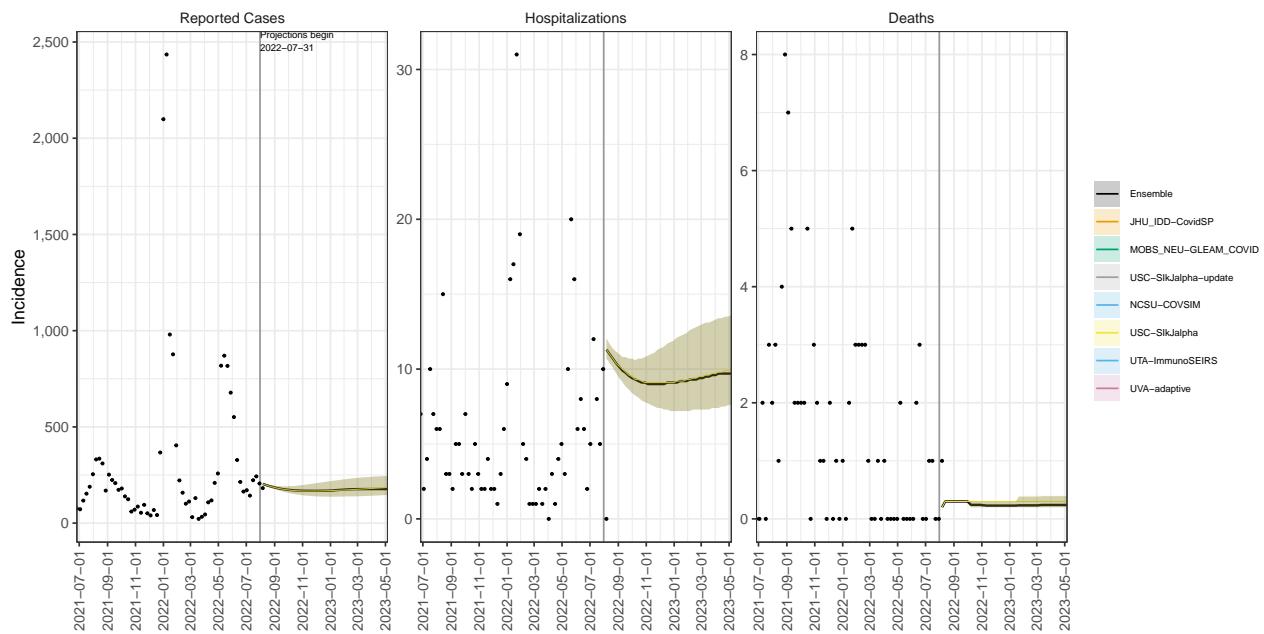
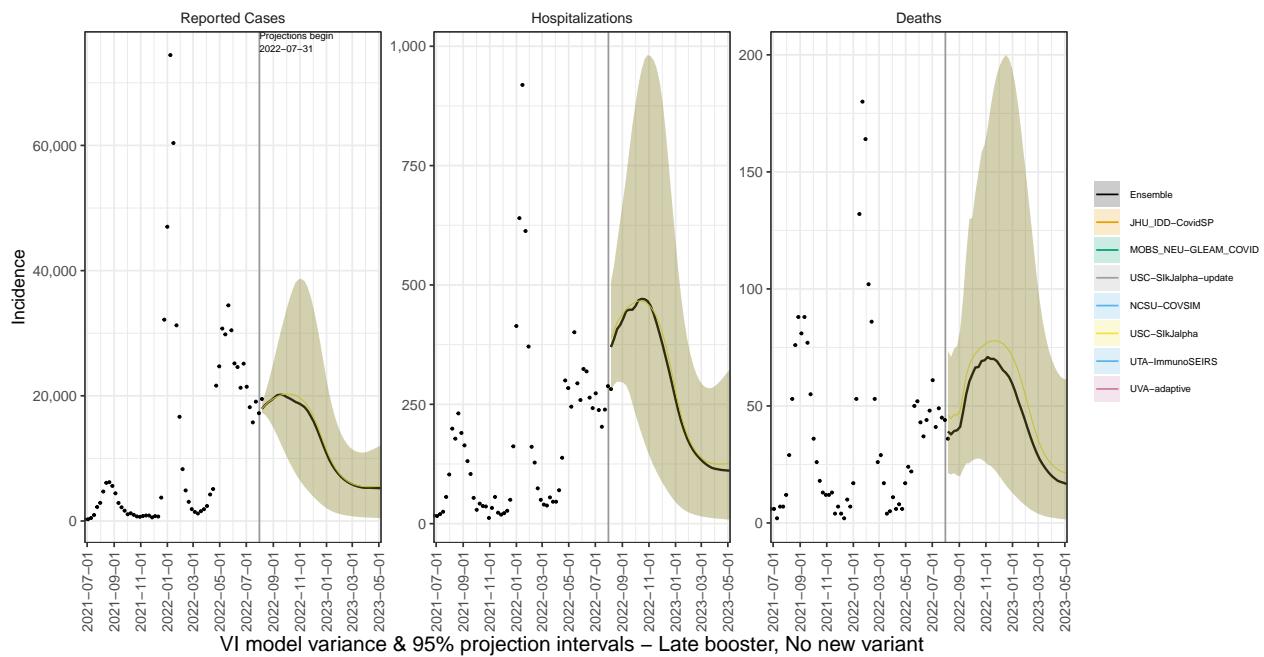
GU model variance & 95% projection intervals – Late booster, No new variant



MP model variance & 95% projection intervals – Late booster, No new variant

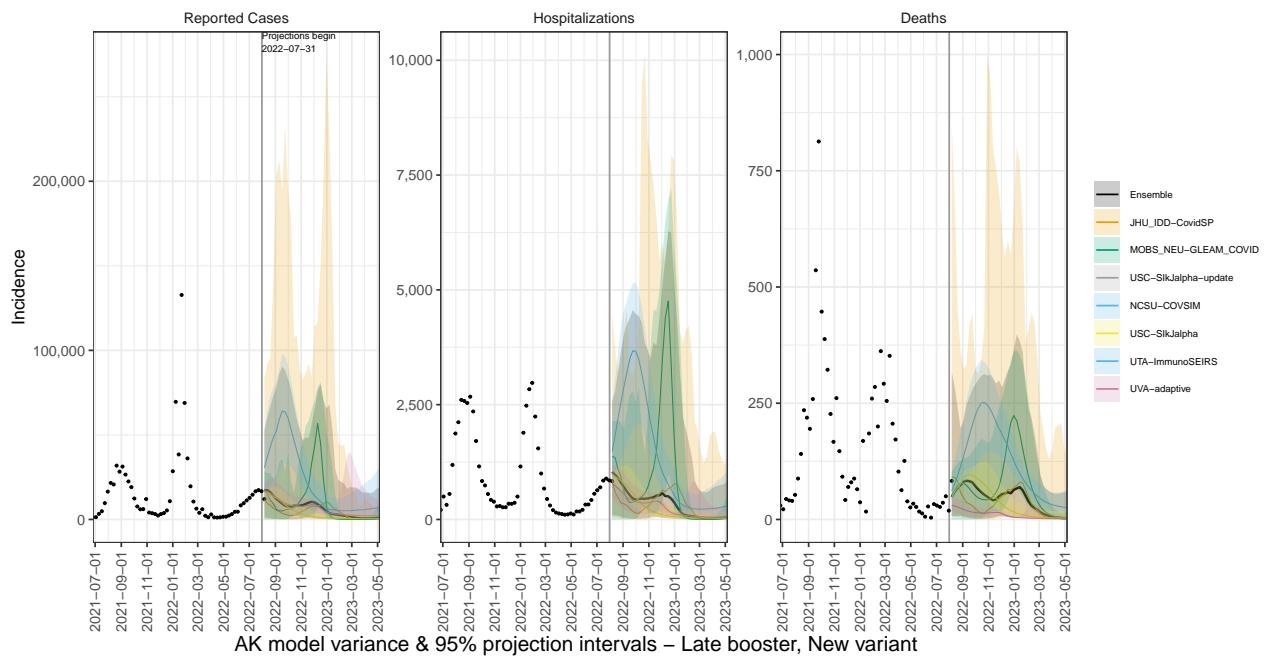


PR model variance & 95% projection intervals – Late booster, No new variant

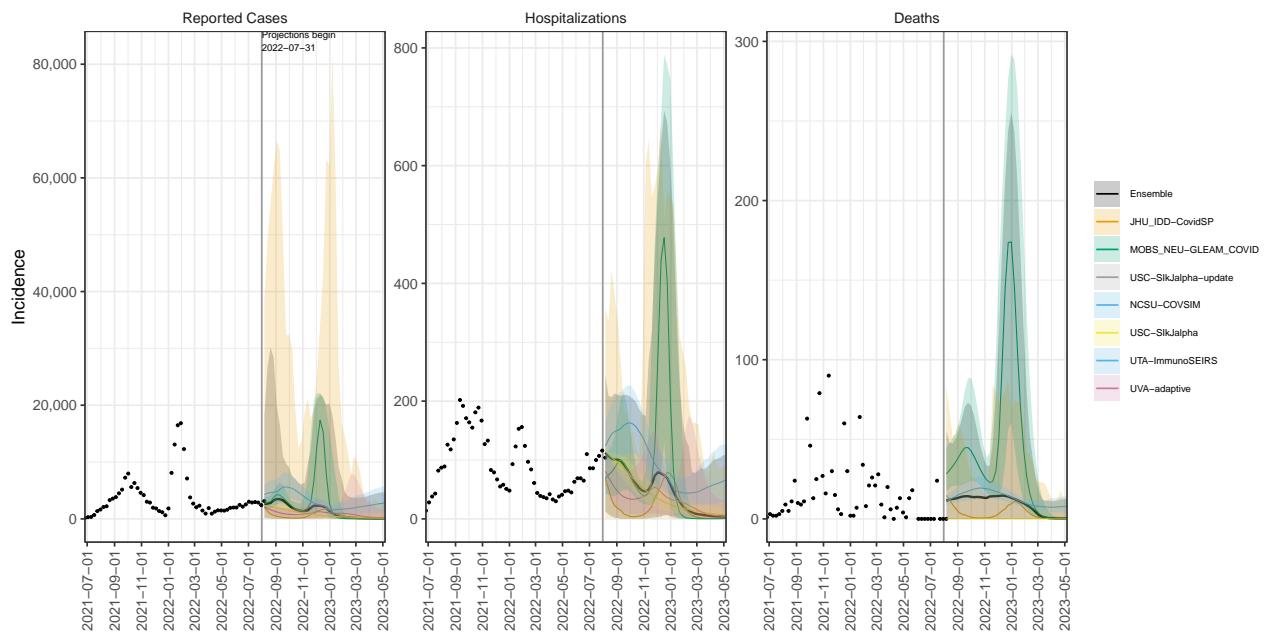


National model variation for the Late booster, New variant scenario.

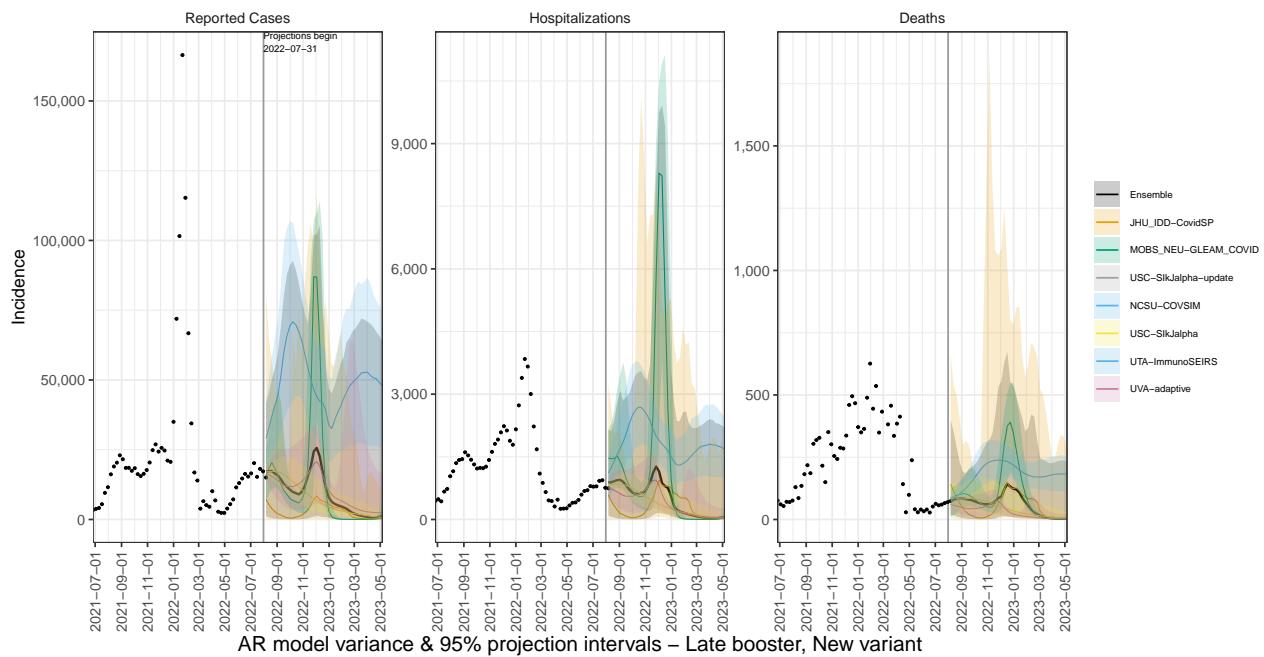
AL model variance & 95% projection intervals – Late booster, New variant



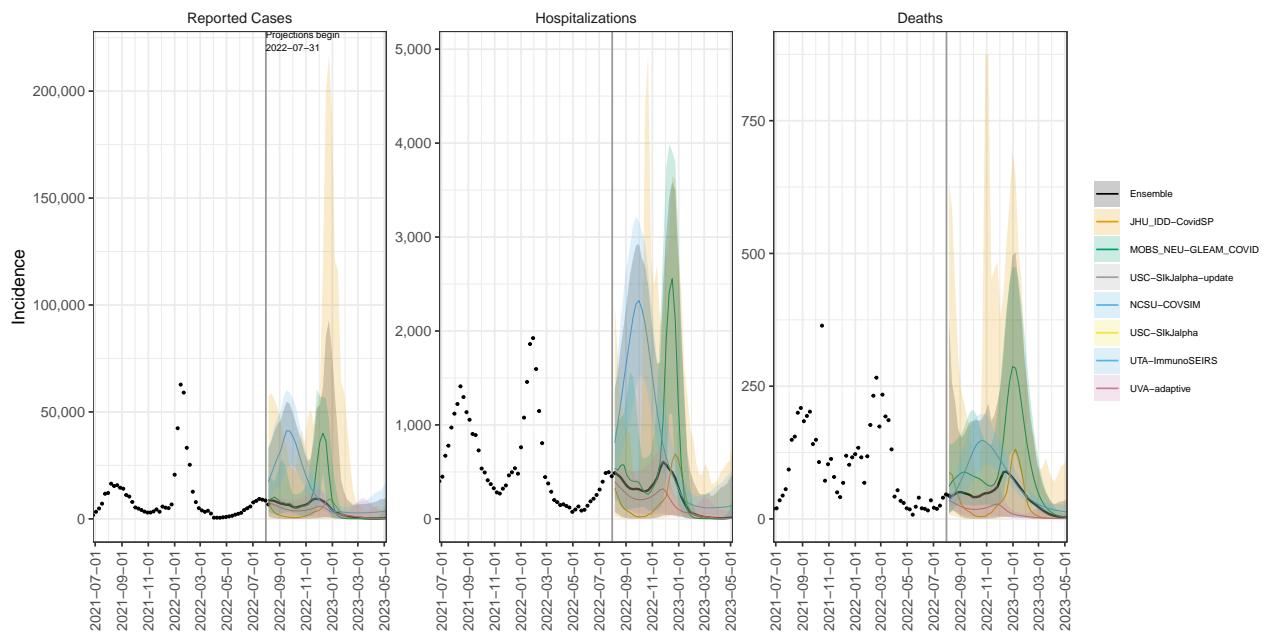
AK model variance & 95% projection intervals – Late booster, New variant



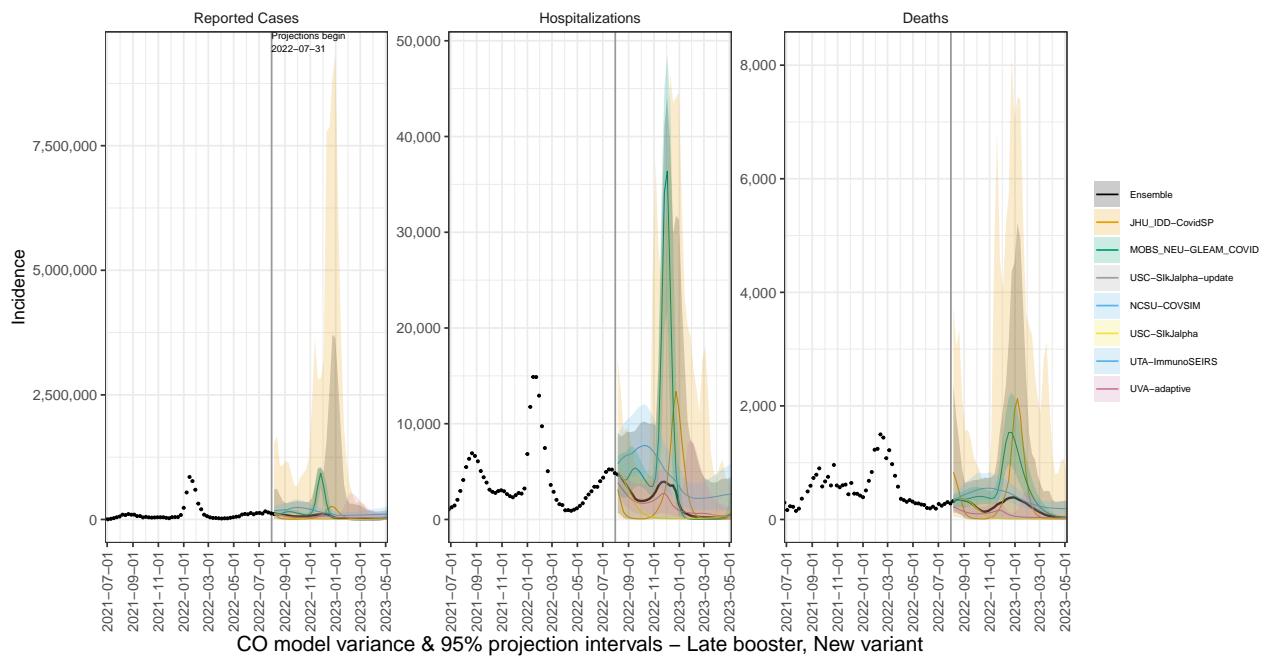
AZ model variance & 95% projection intervals – Late booster, New variant



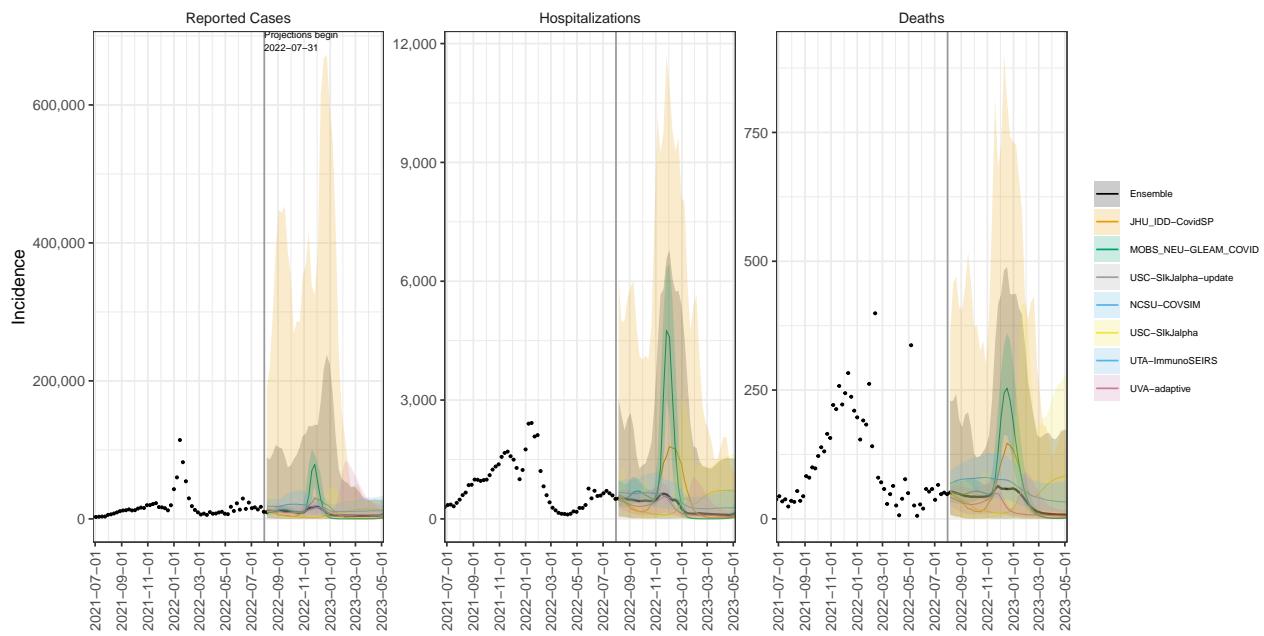
AR model variance & 95% projection intervals – Late booster, New variant



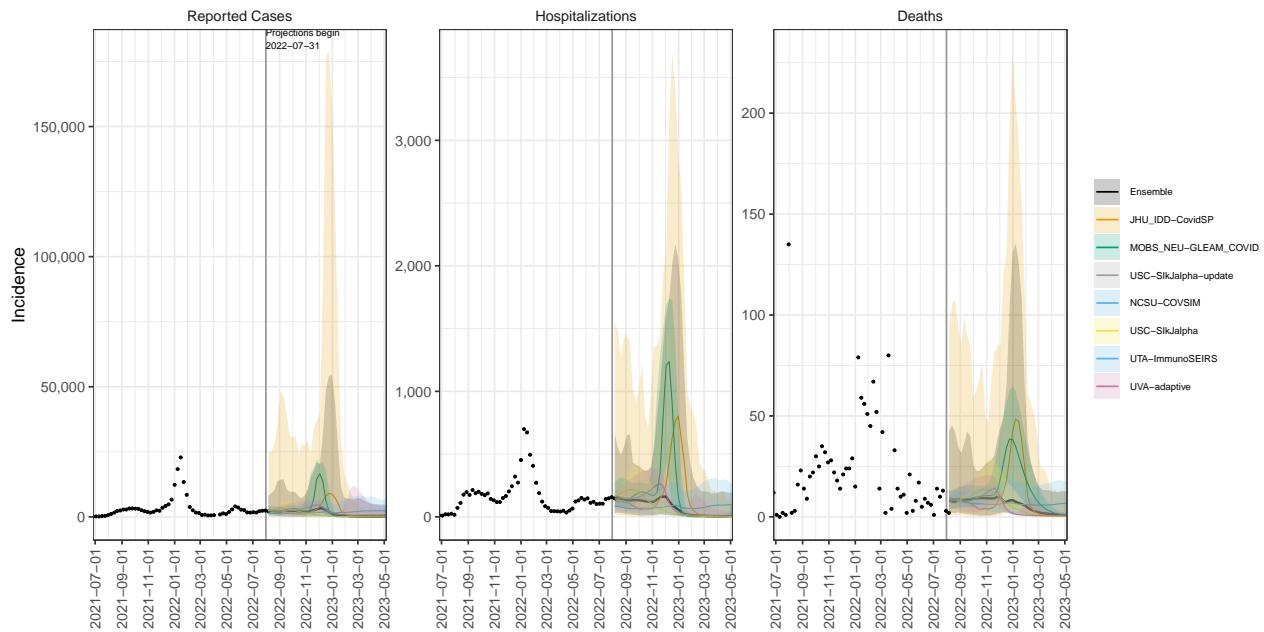
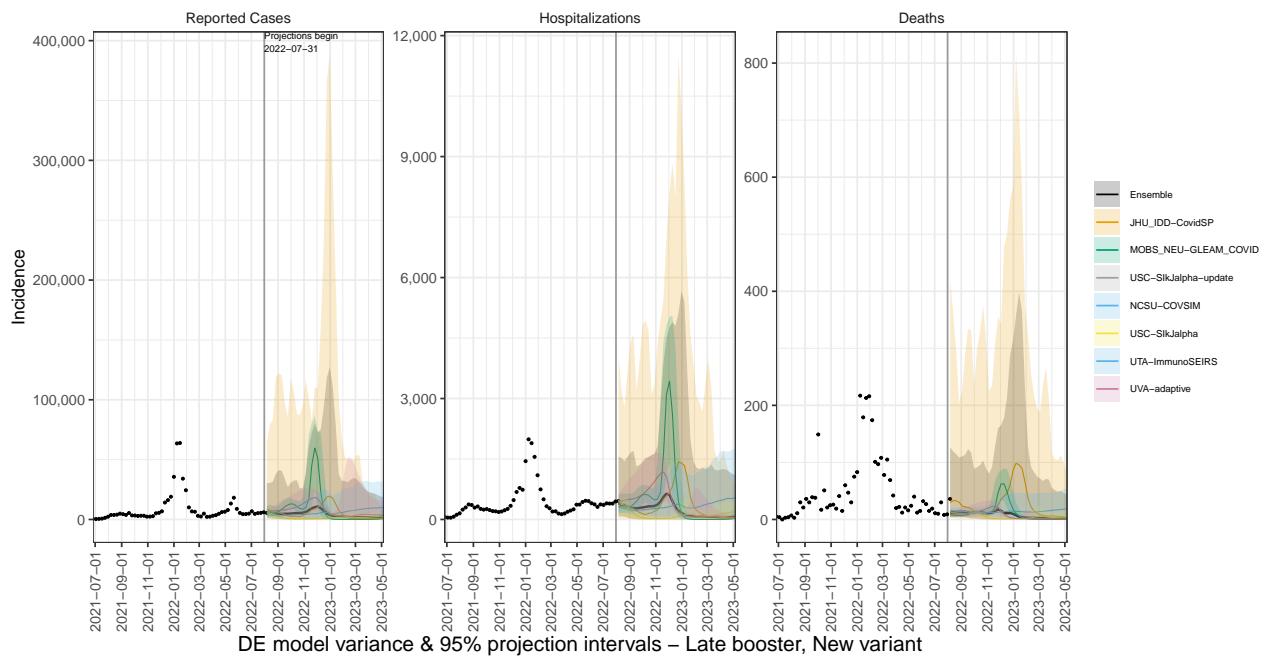
CA model variance & 95% projection intervals – Late booster, New variant



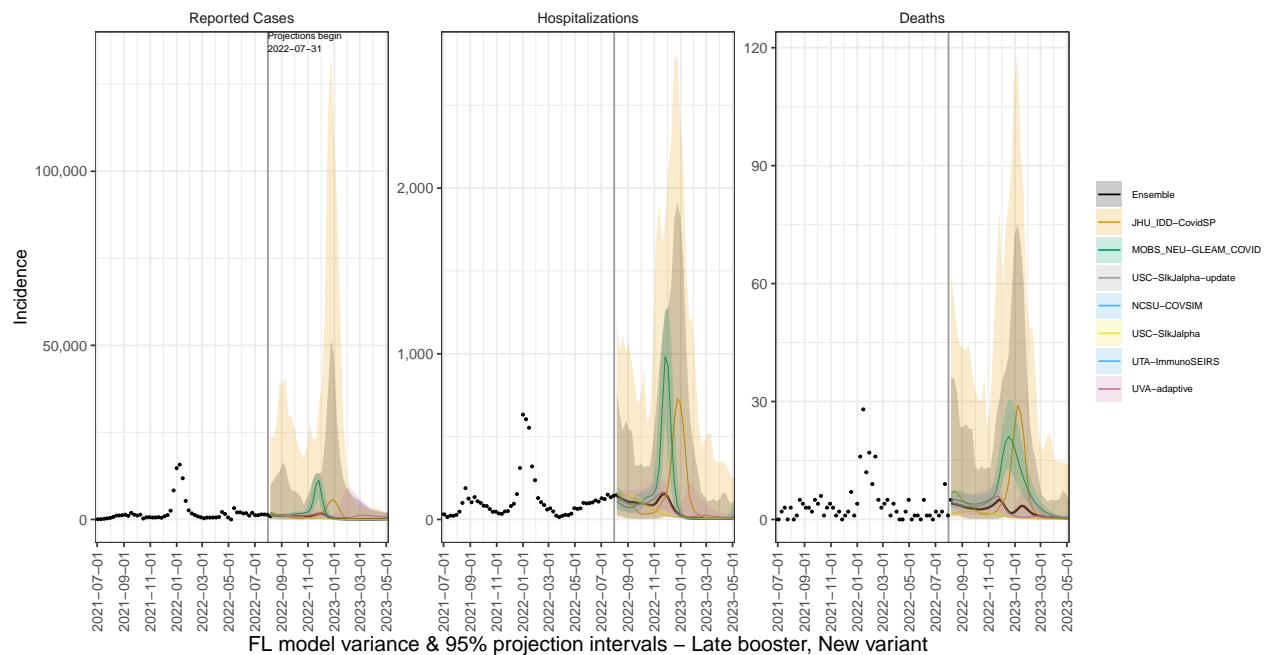
CO model variance & 95% projection intervals – Late booster, New variant



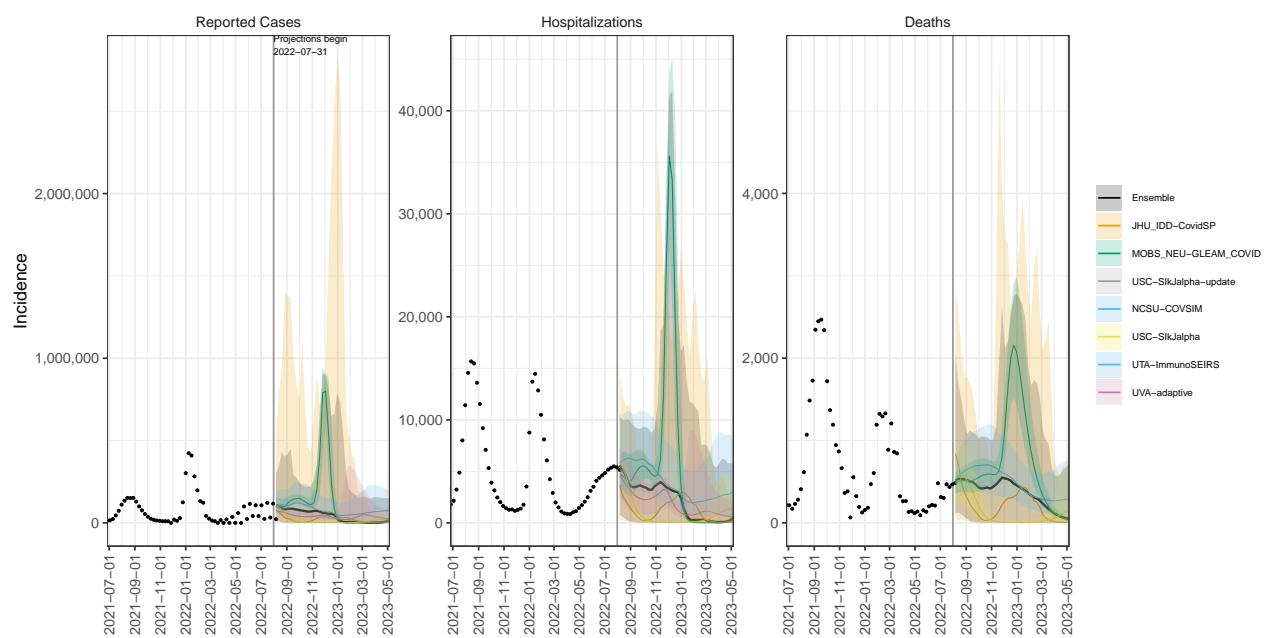
CT model variance & 95% projection intervals – Late booster, New variant



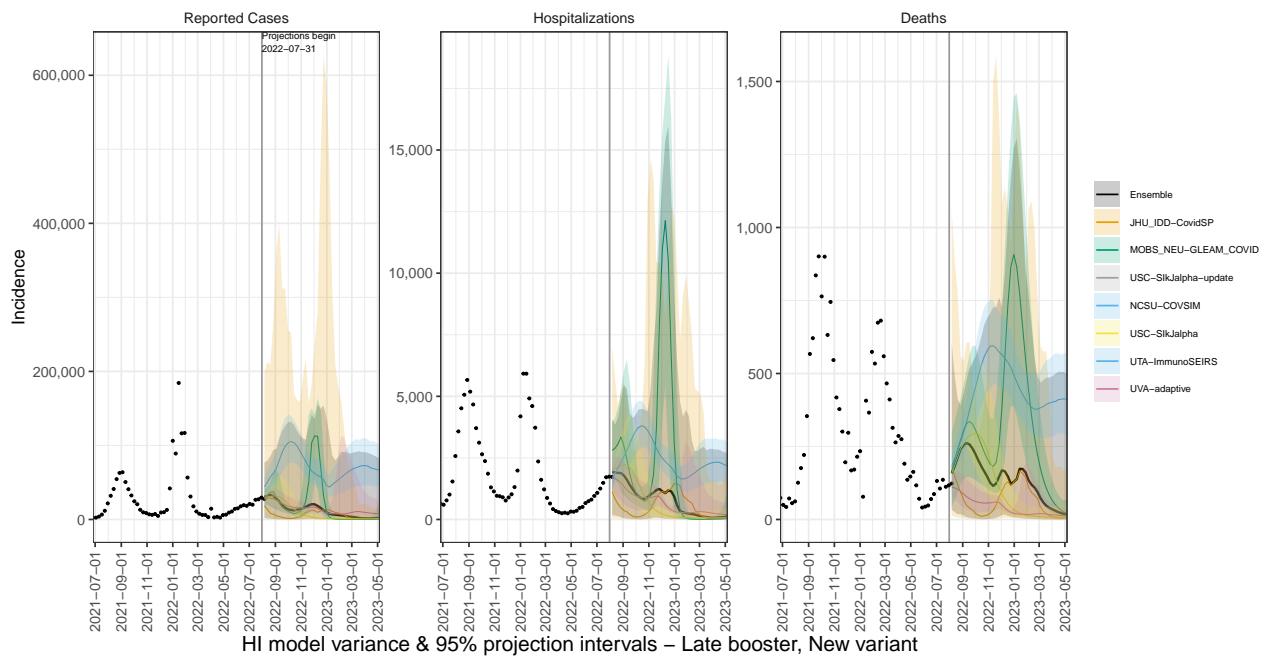
DC model variance & 95% projection intervals – Late booster, New variant



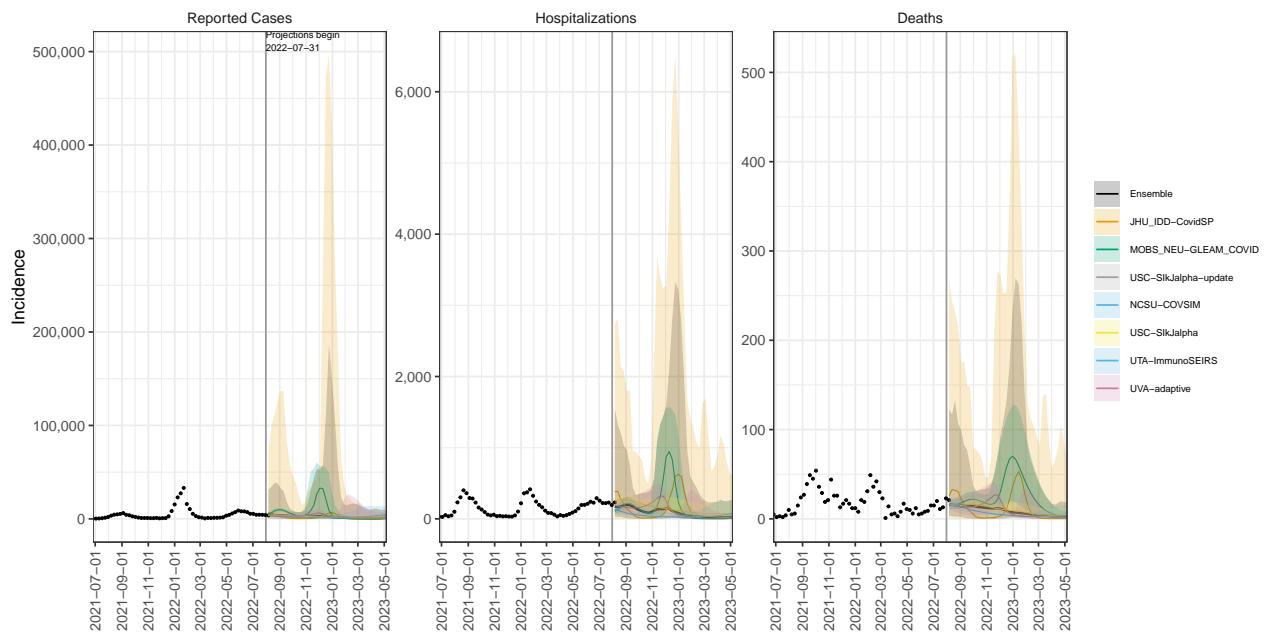
FL model variance & 95% projection intervals – Late booster, New variant



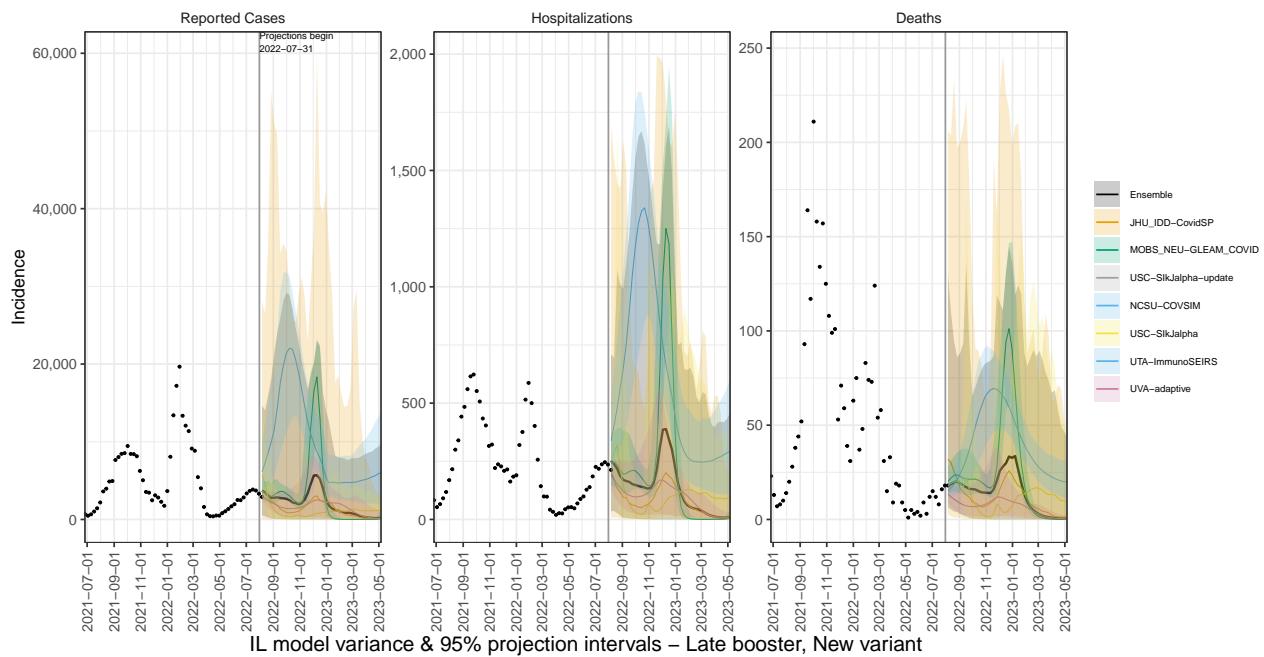
GA model variance & 95% projection intervals – Late booster, New variant



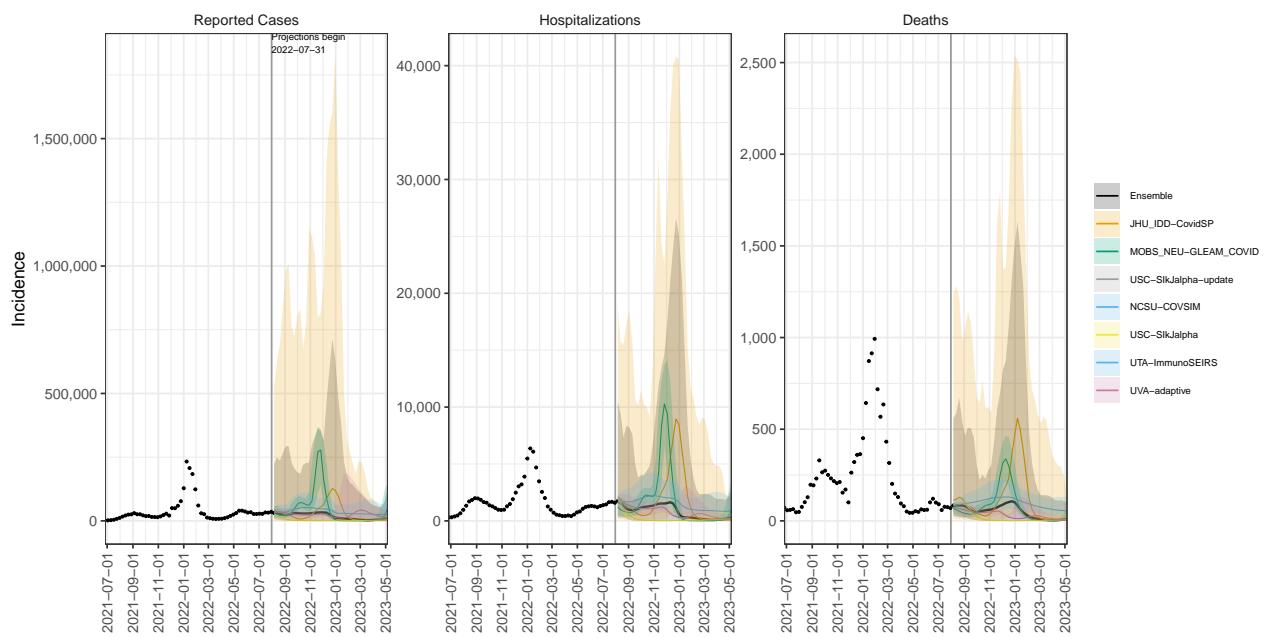
HI model variance & 95% projection intervals – Late booster, New variant



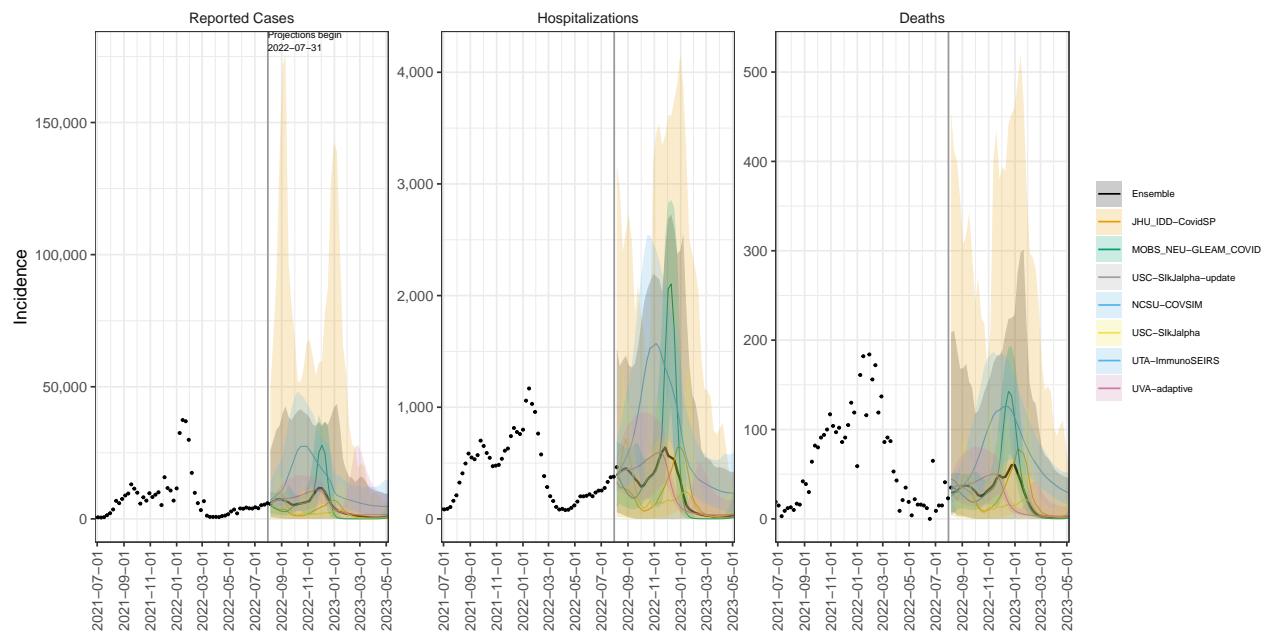
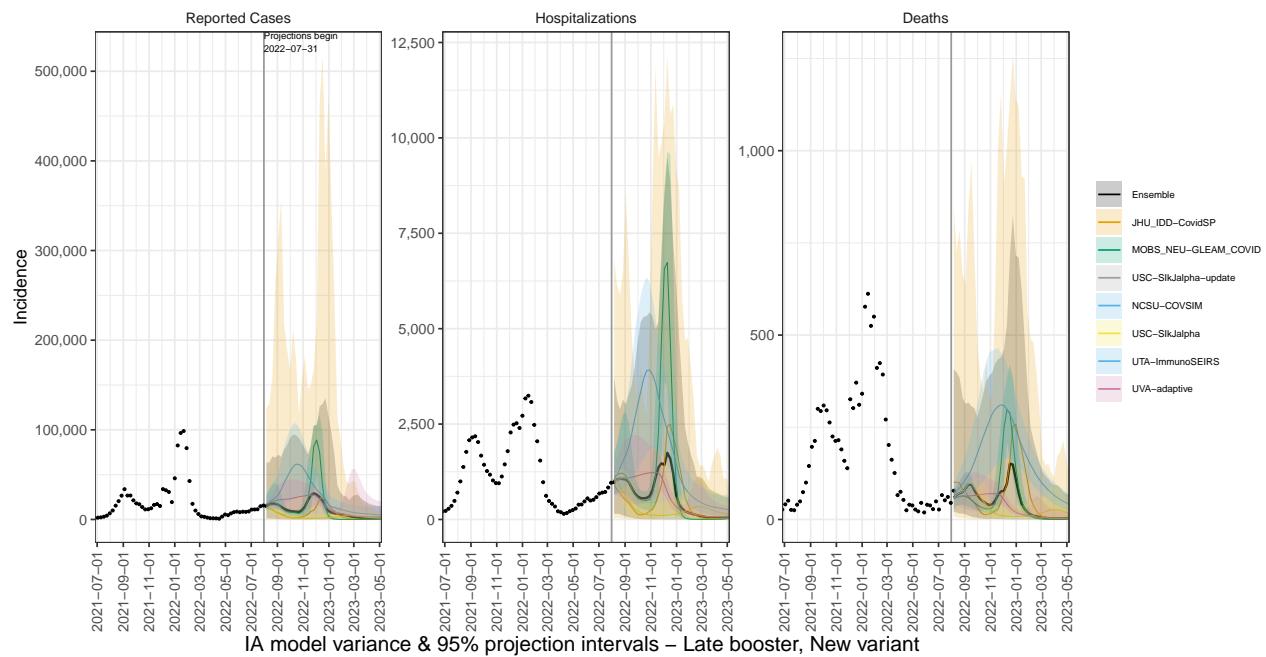
ID model variance & 95% projection intervals – Late booster, New variant



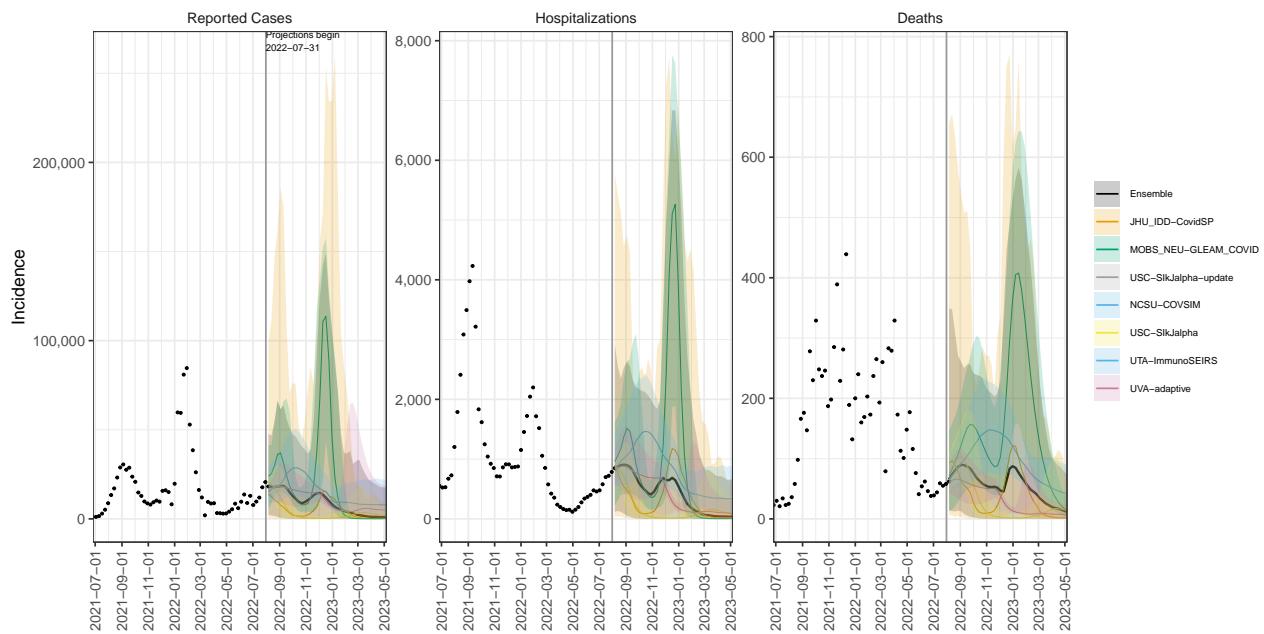
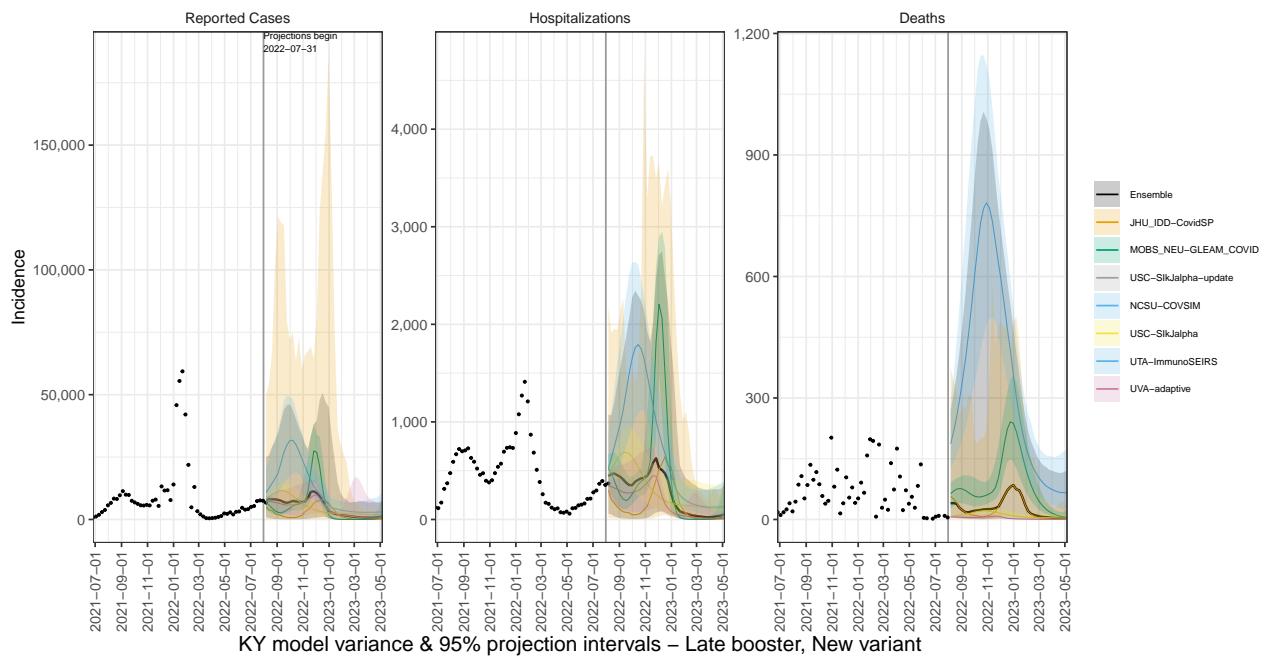
IL model variance & 95% projection intervals – Late booster, New variant



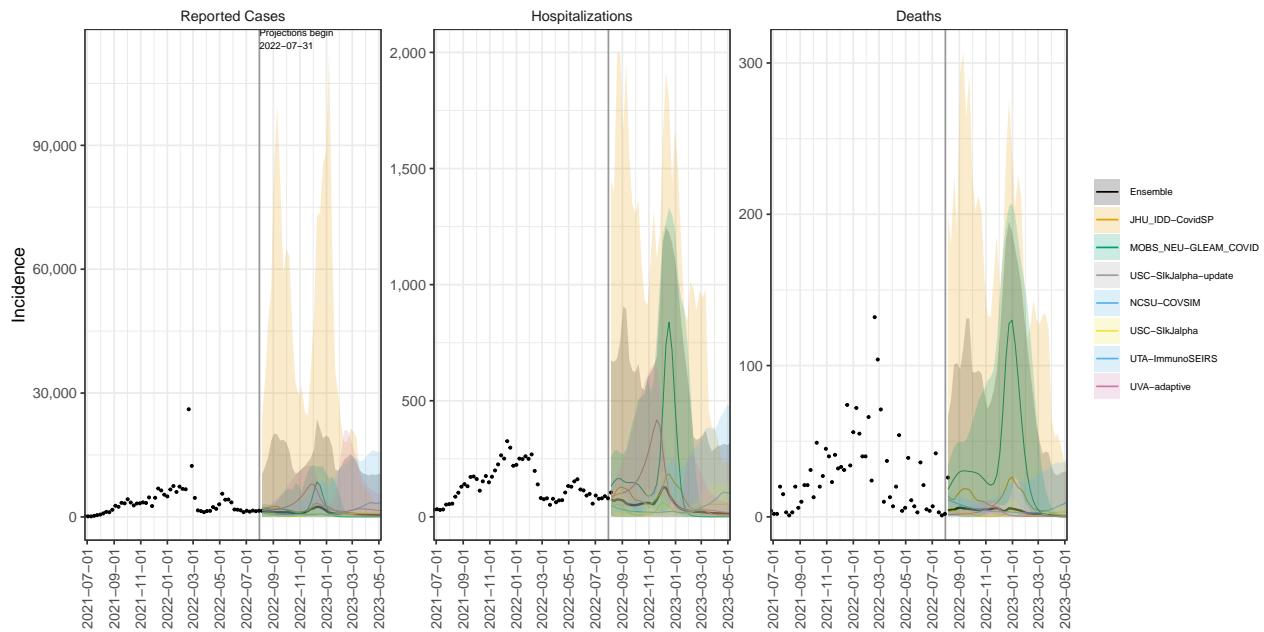
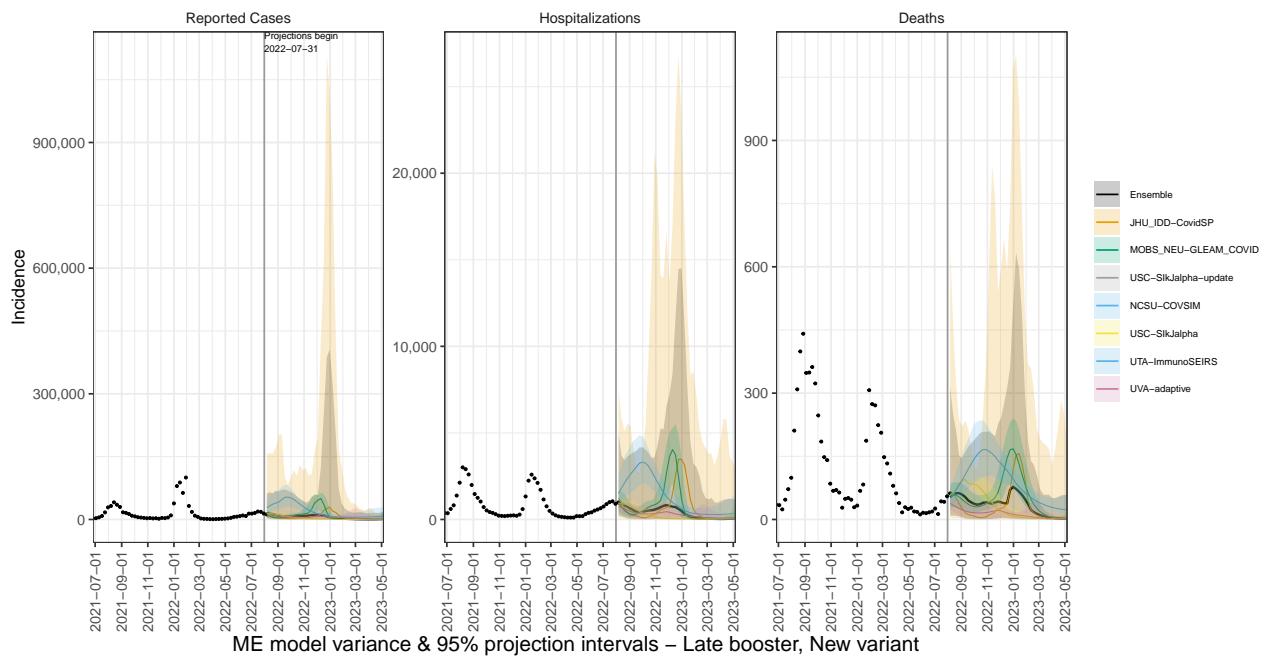
IN model variance & 95% projection intervals – Late booster, New variant



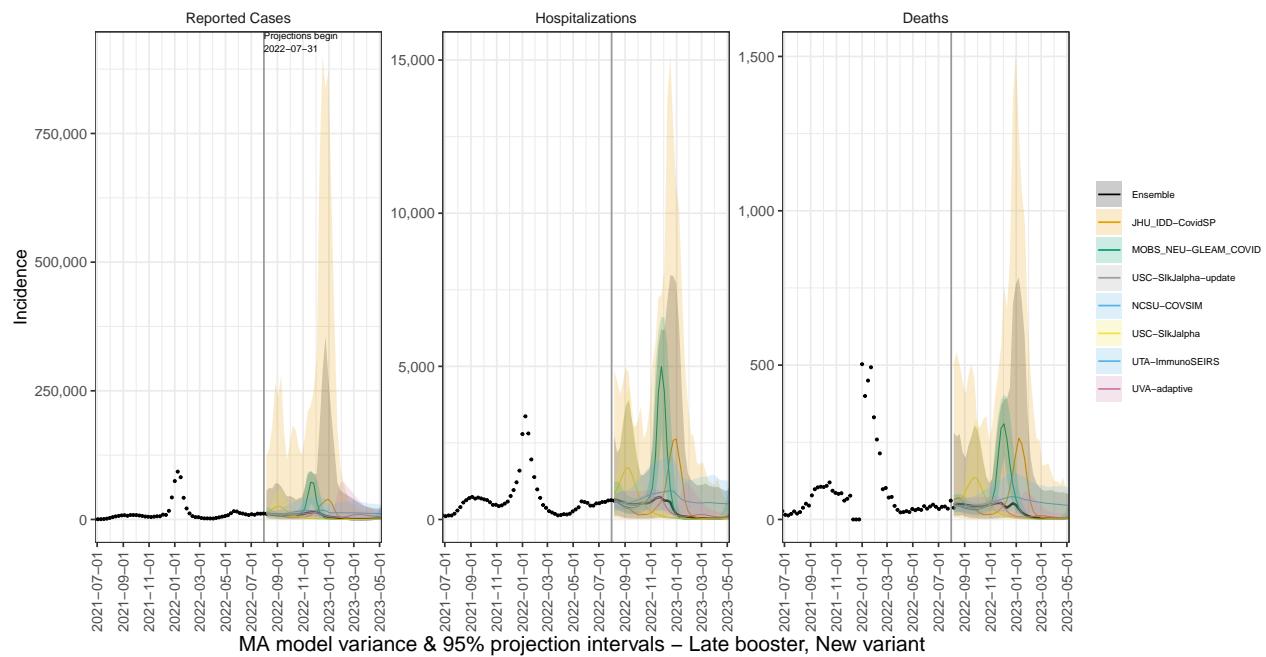
KS model variance & 95% projection intervals – Late booster, New variant



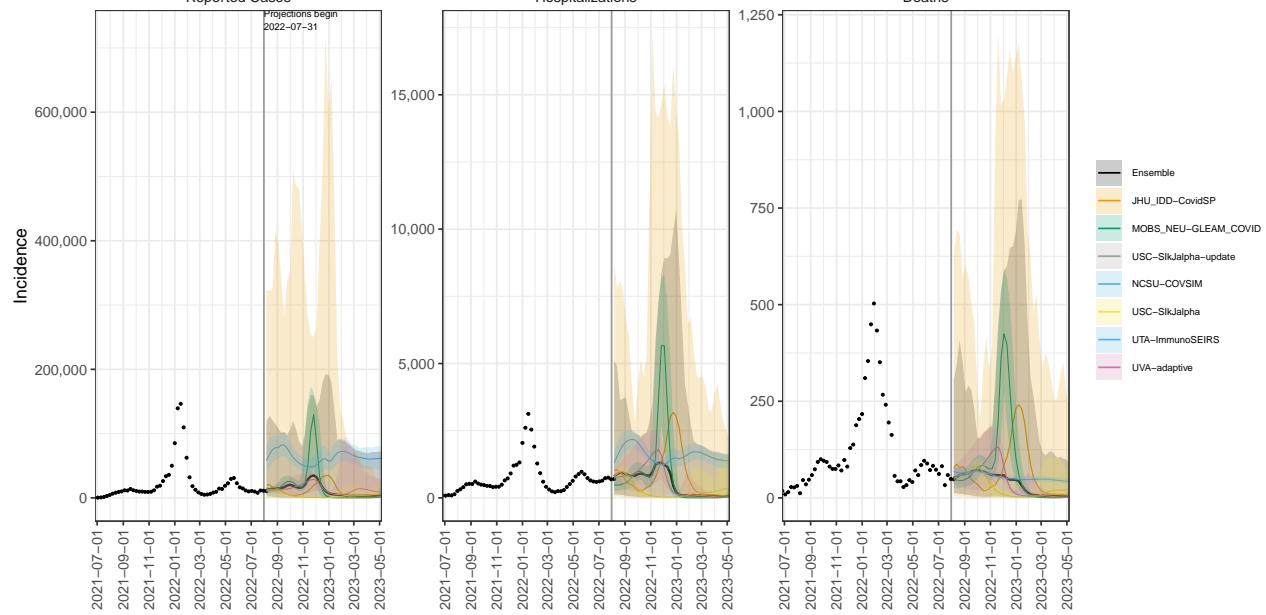
LA model variance & 95% projection intervals – Late booster, New variant



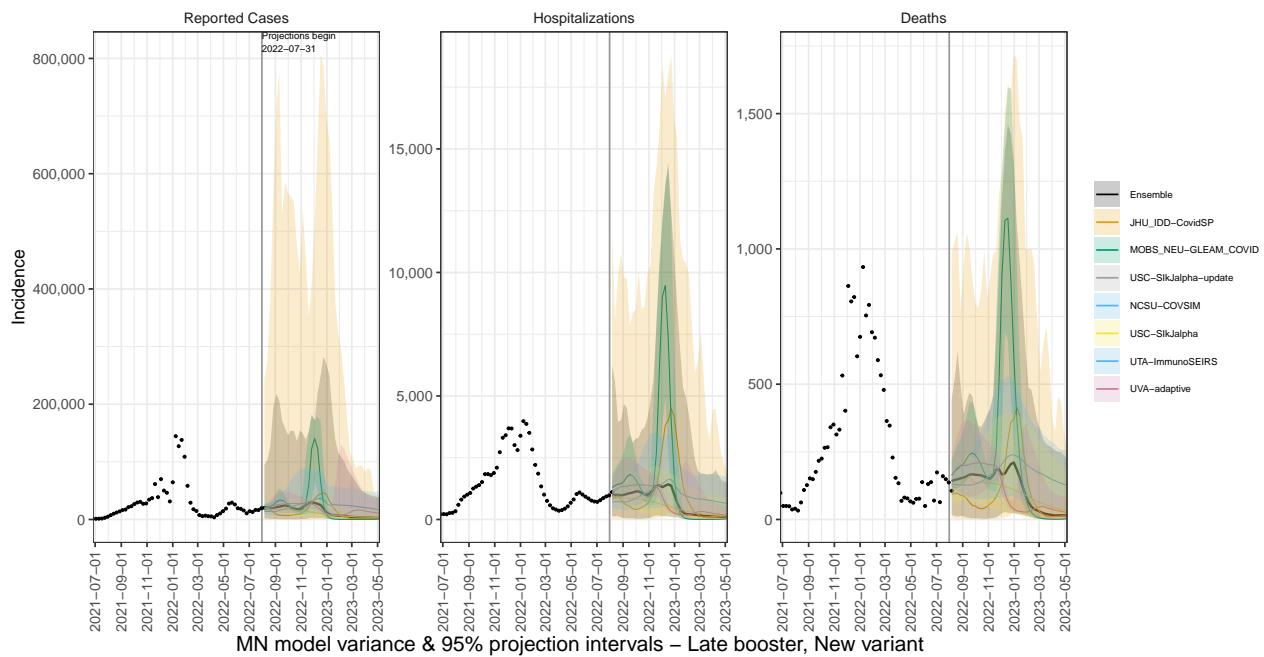
MD model variance & 95% projection intervals – Late booster, New variant



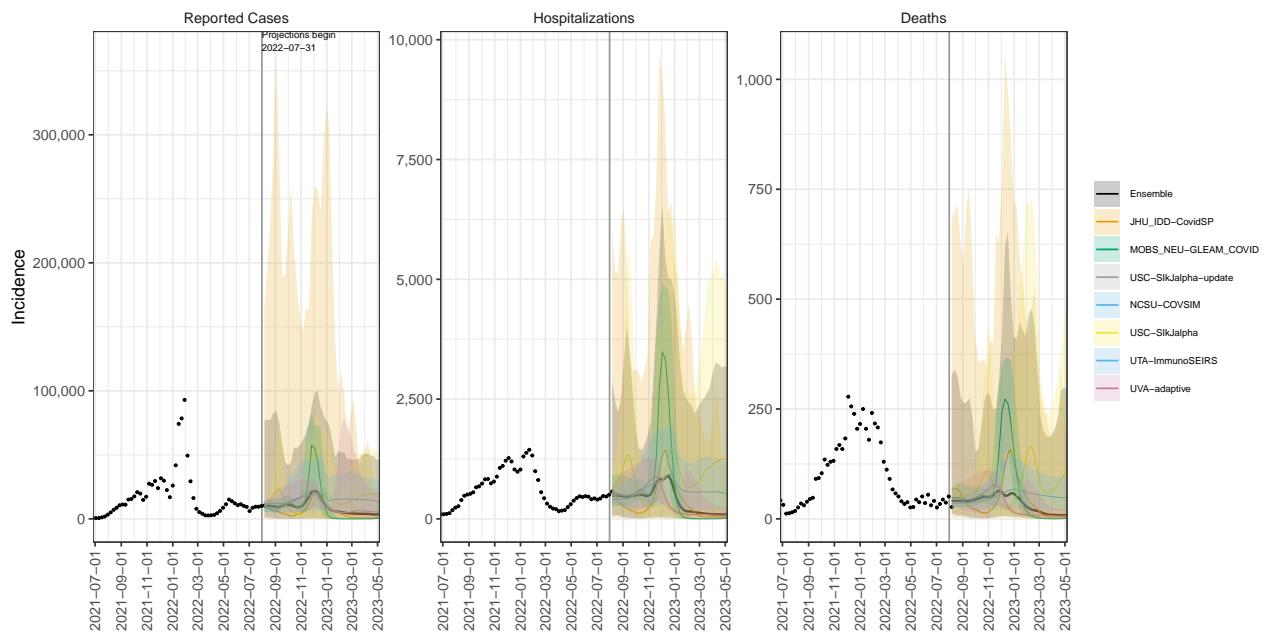
MA model variance & 95% projection intervals – Late booster, New variant



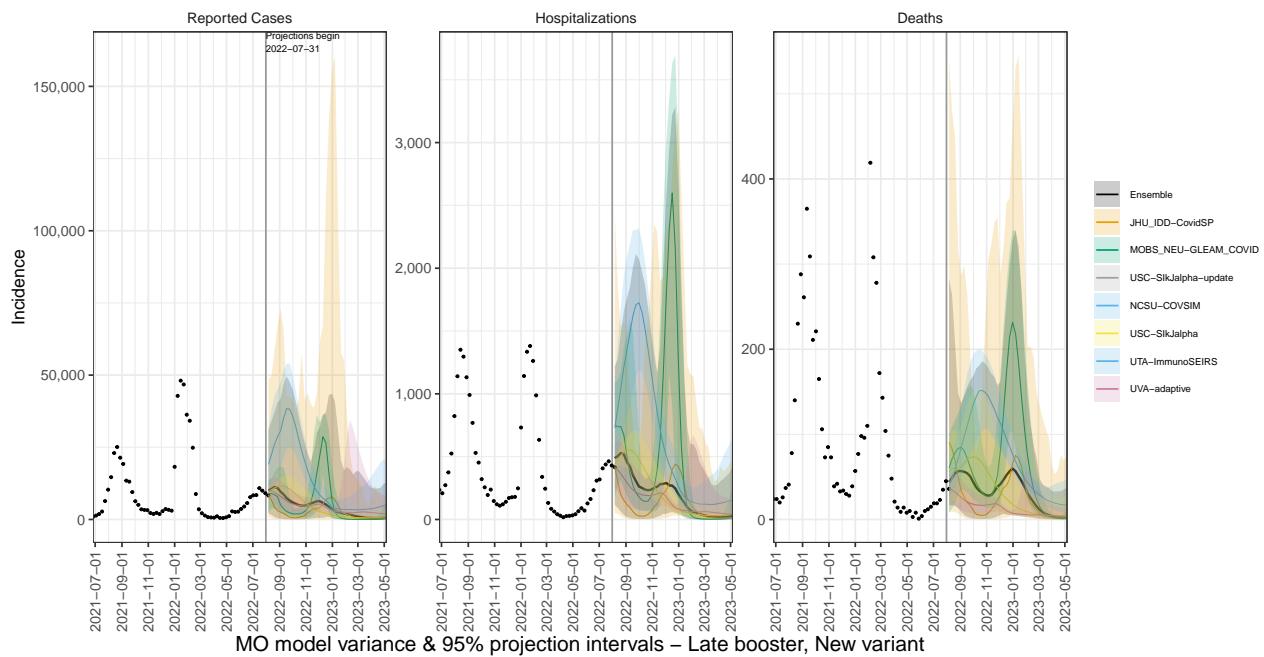
MI model variance & 95% projection intervals – Late booster, New variant



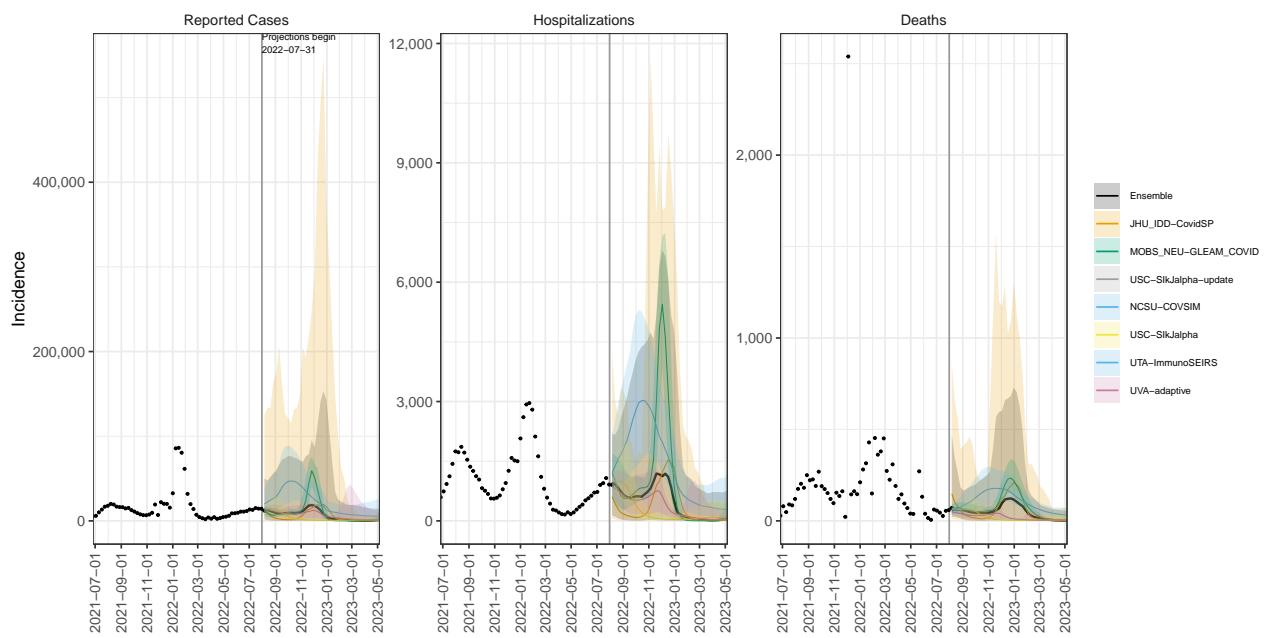
MN model variance & 95% projection intervals – Late booster, New variant



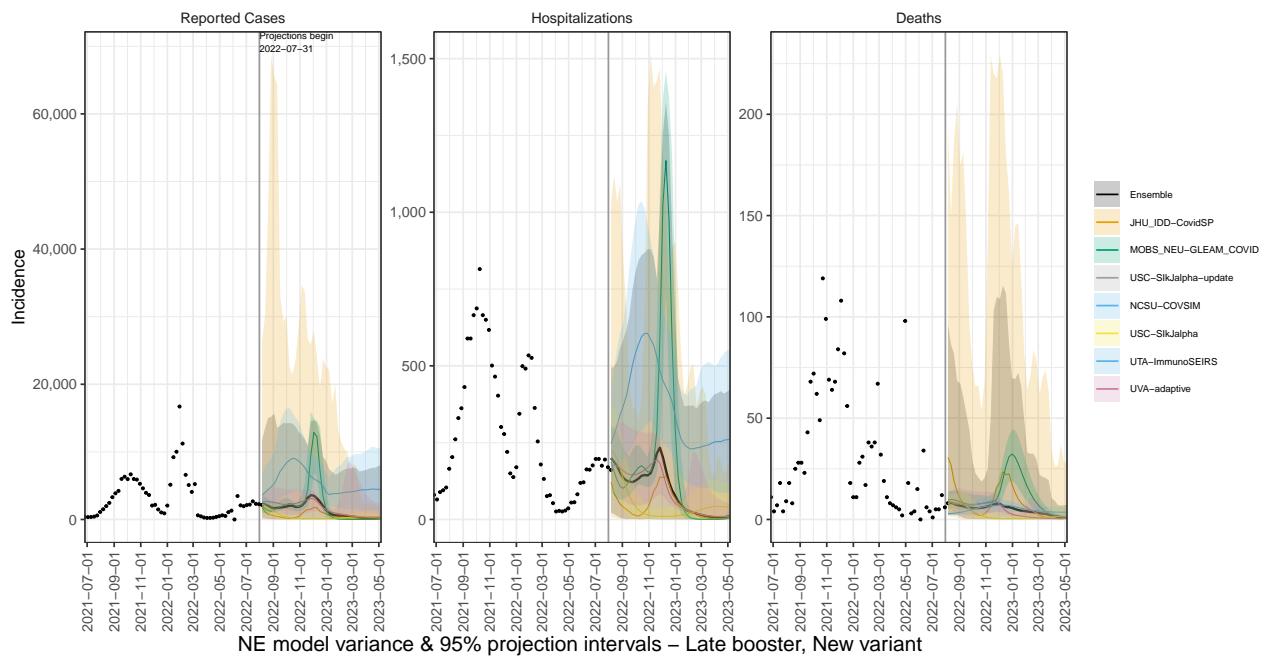
MS model variance & 95% projection intervals – Late booster, New variant



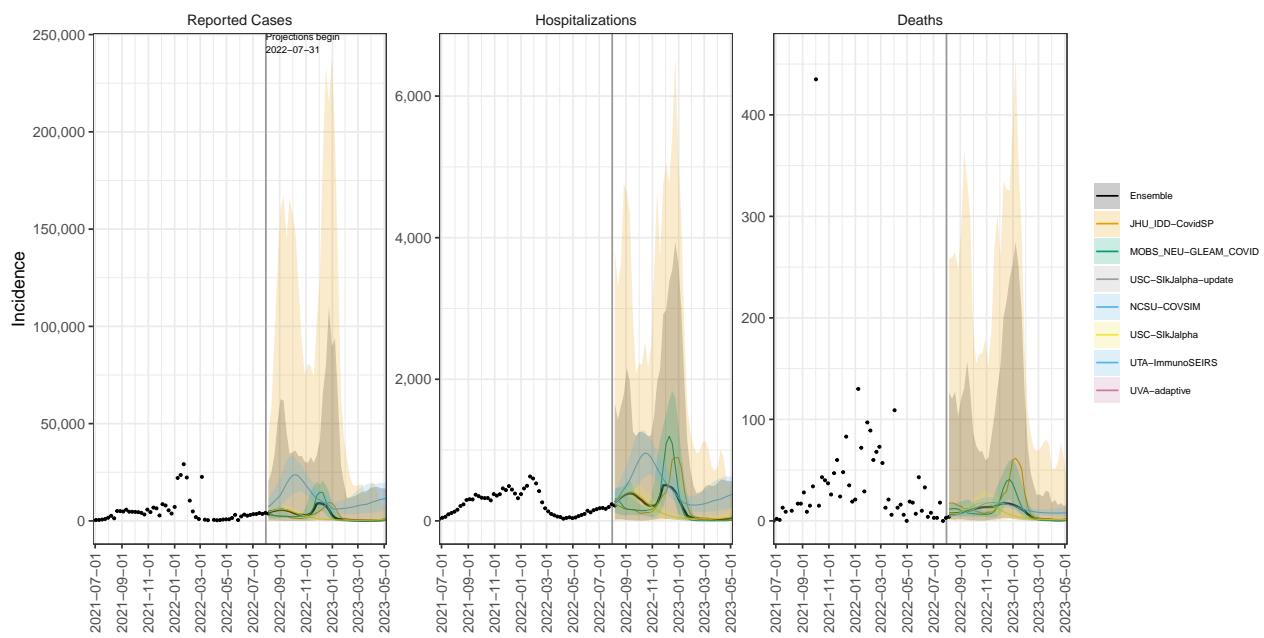
MO model variance & 95% projection intervals – Late booster, New variant



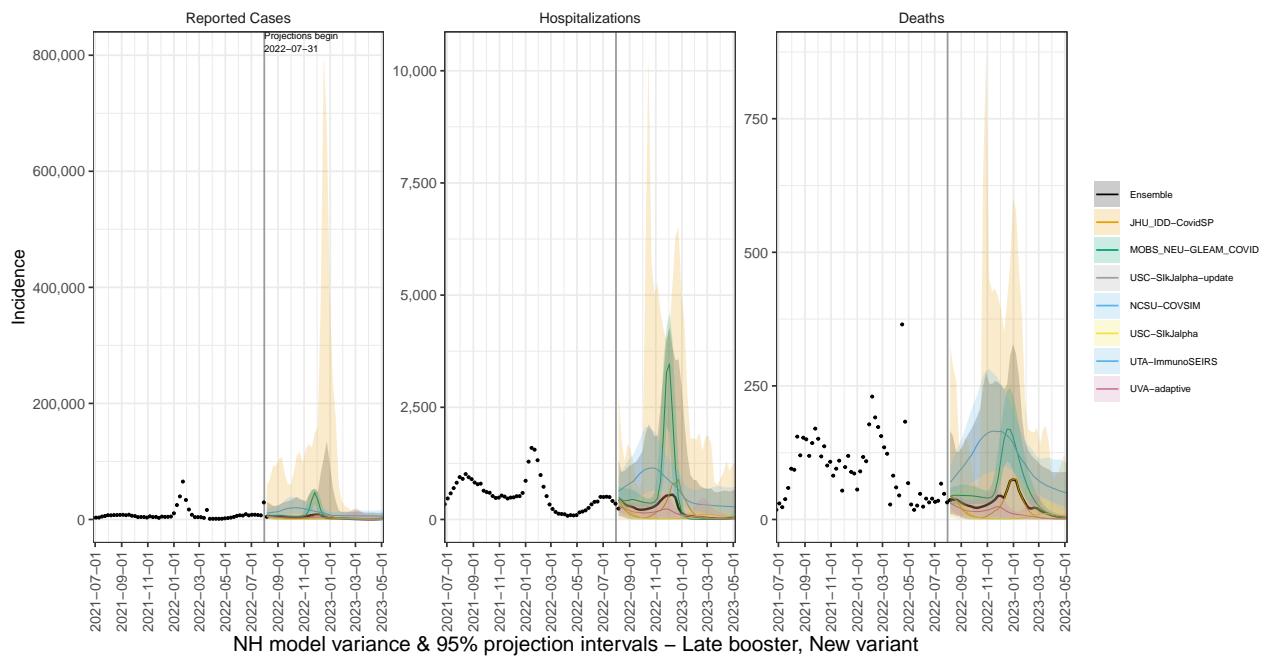
MT model variance & 95% projection intervals – Late booster, New variant



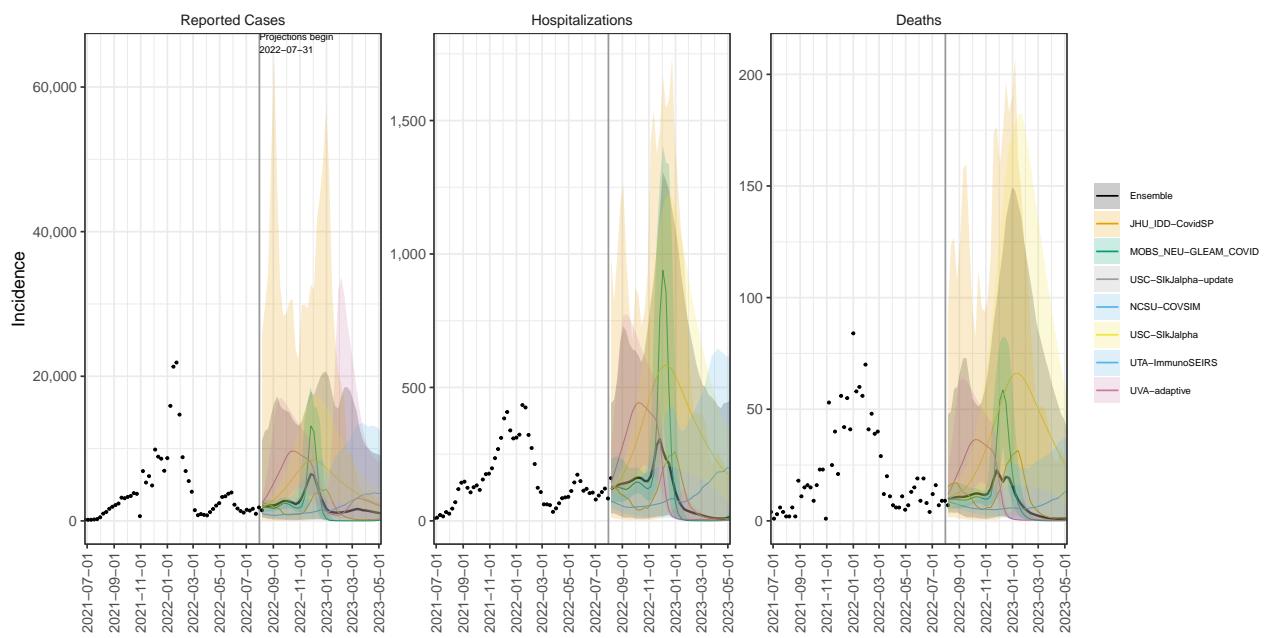
NE model variance & 95% projection intervals – Late booster, New variant



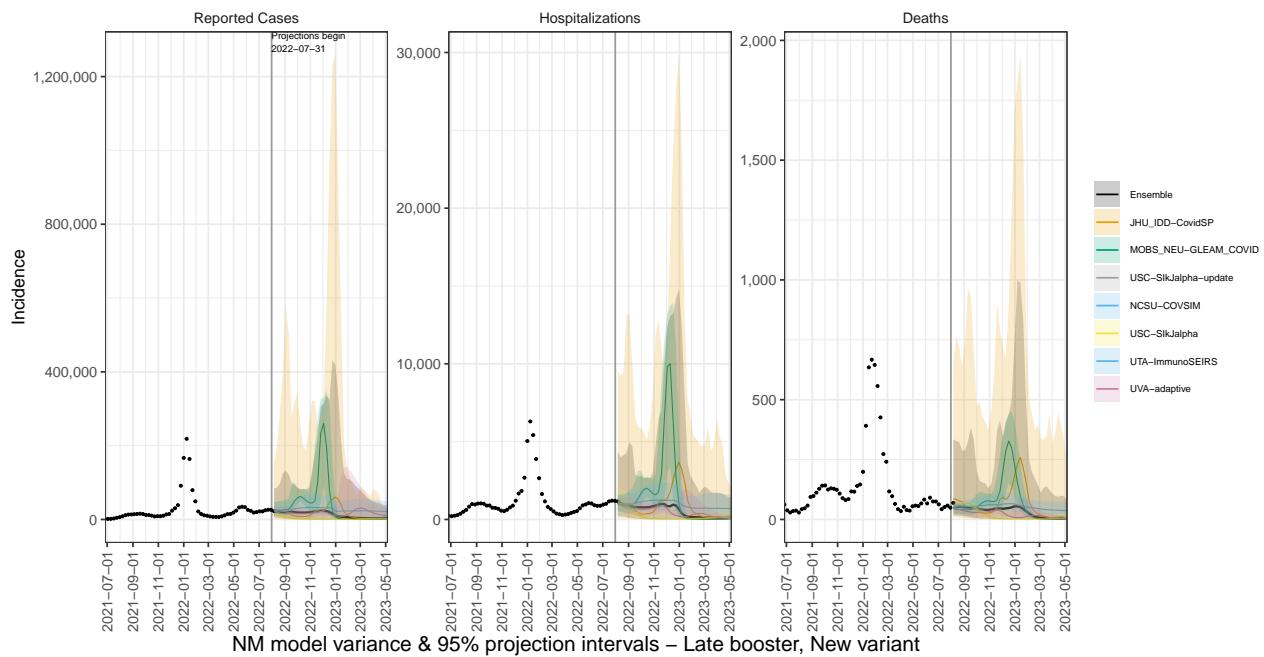
NV model variance & 95% projection intervals – Late booster, New variant



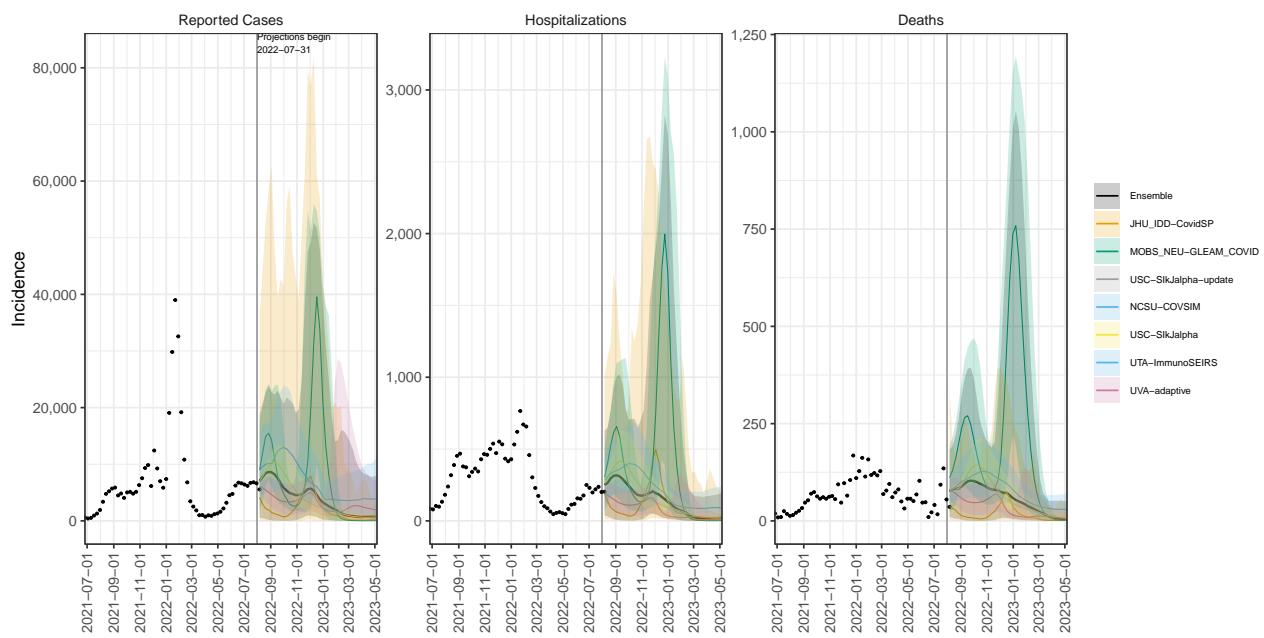
NH model variance & 95% projection intervals – Late booster, New variant



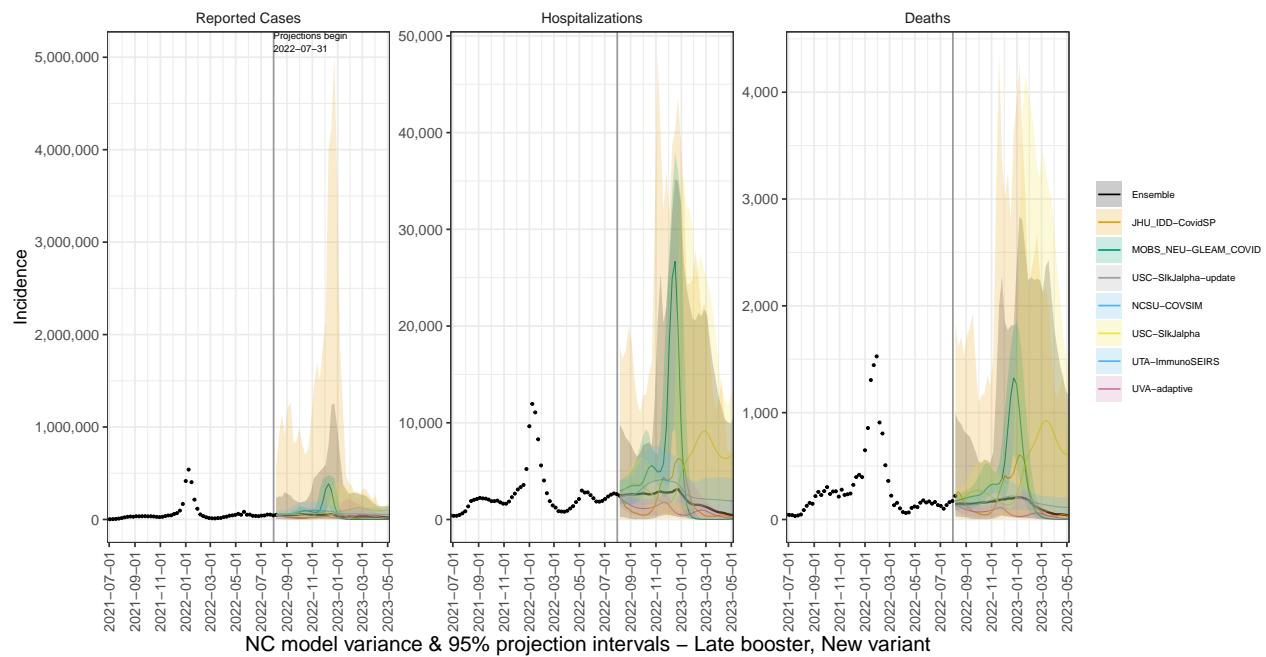
NJ model variance & 95% projection intervals – Late booster, New variant



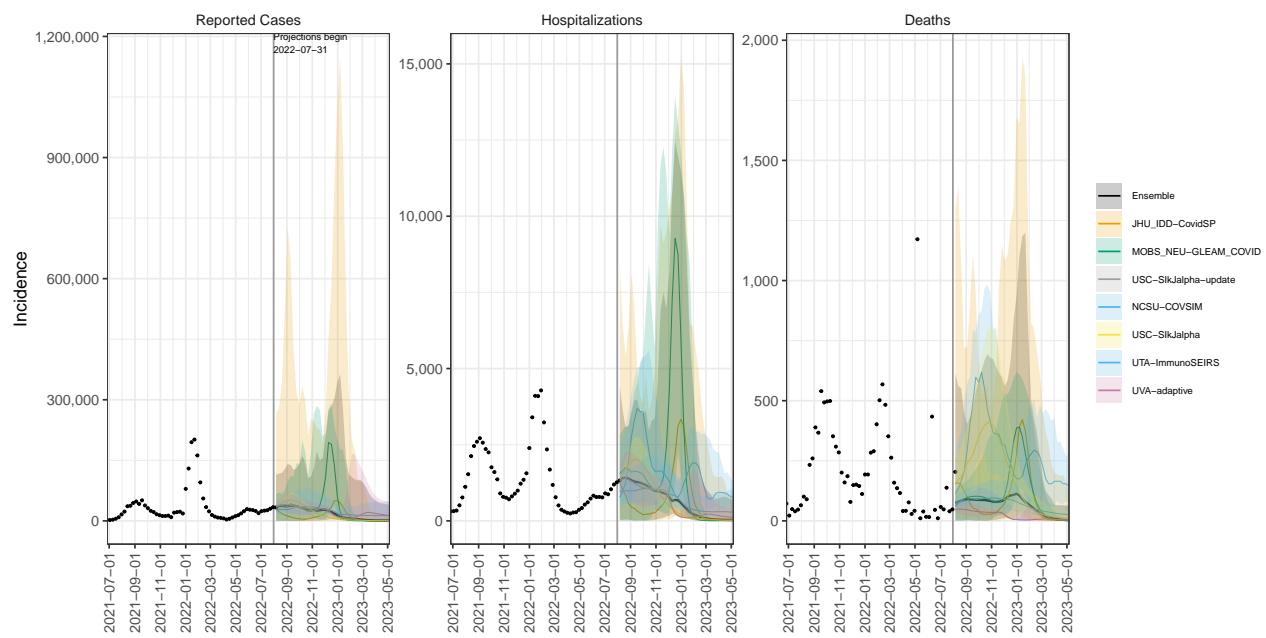
NM model variance & 95% projection intervals – Late booster, New variant



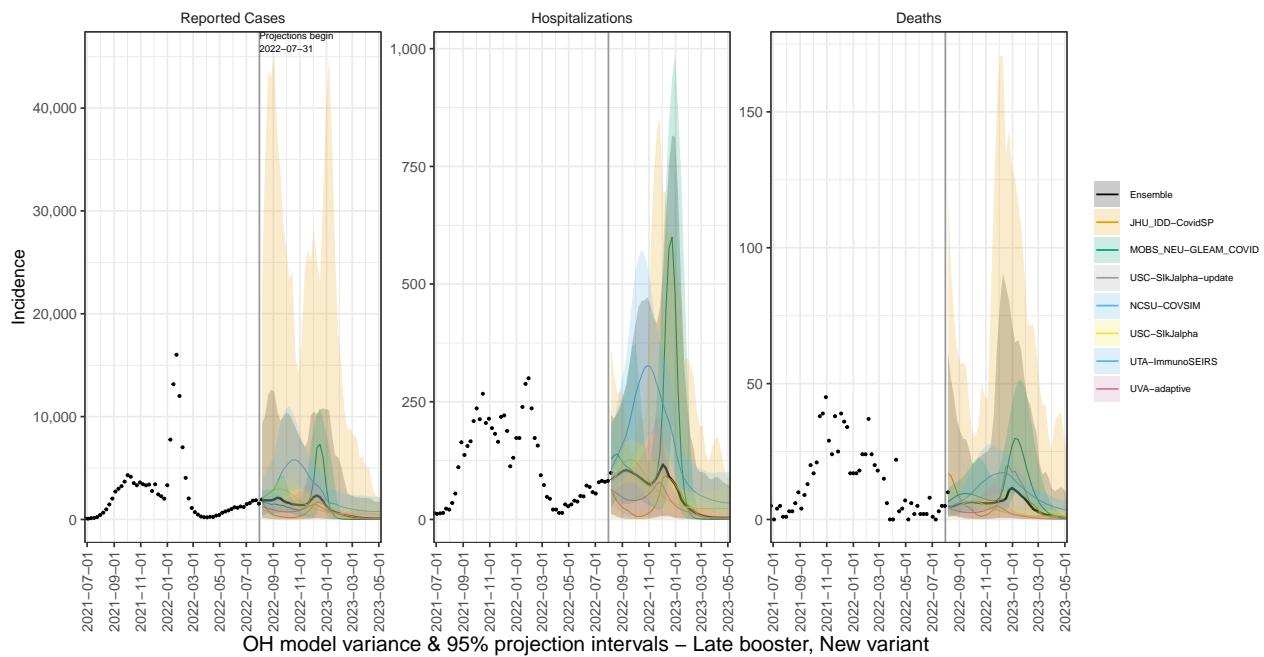
NY model variance & 95% projection intervals – Late booster, New variant



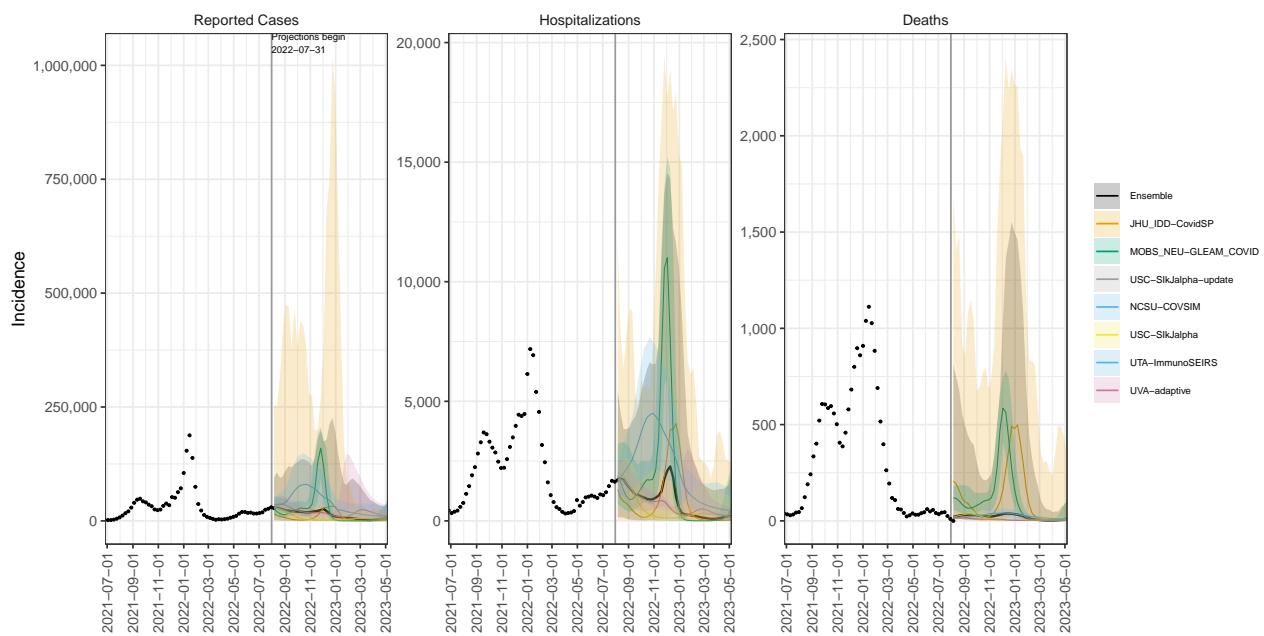
NC model variance & 95% projection intervals – Late booster, New variant



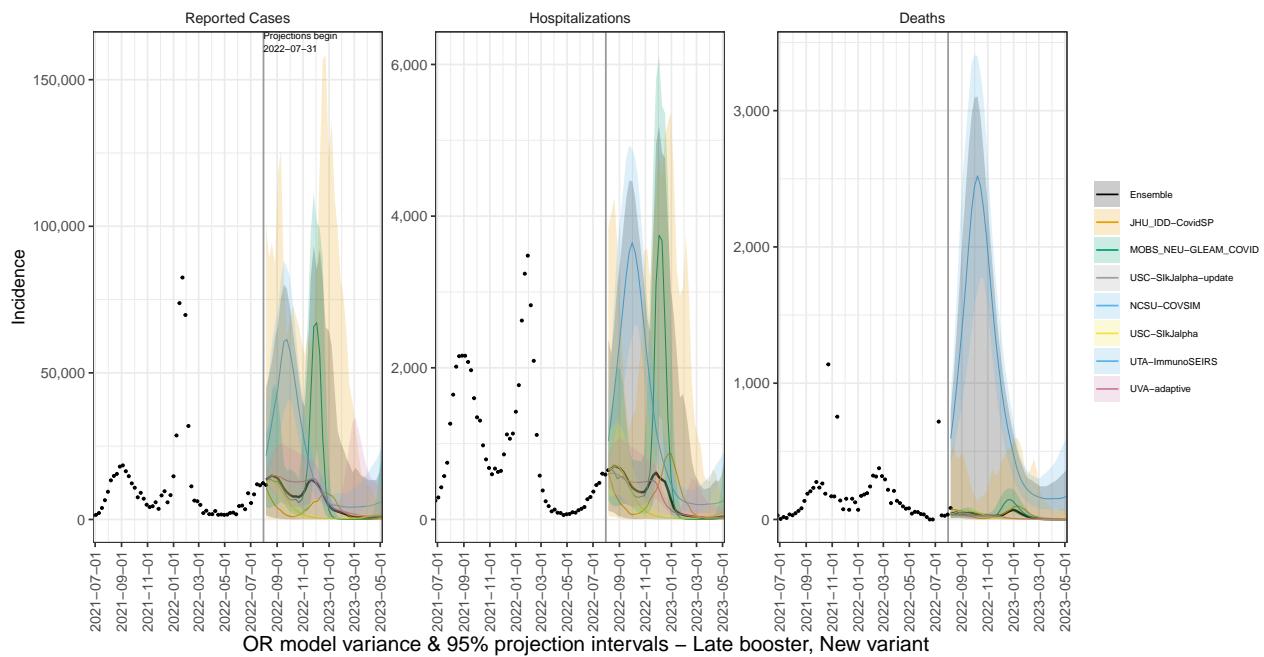
ND model variance & 95% projection intervals – Late booster, New variant



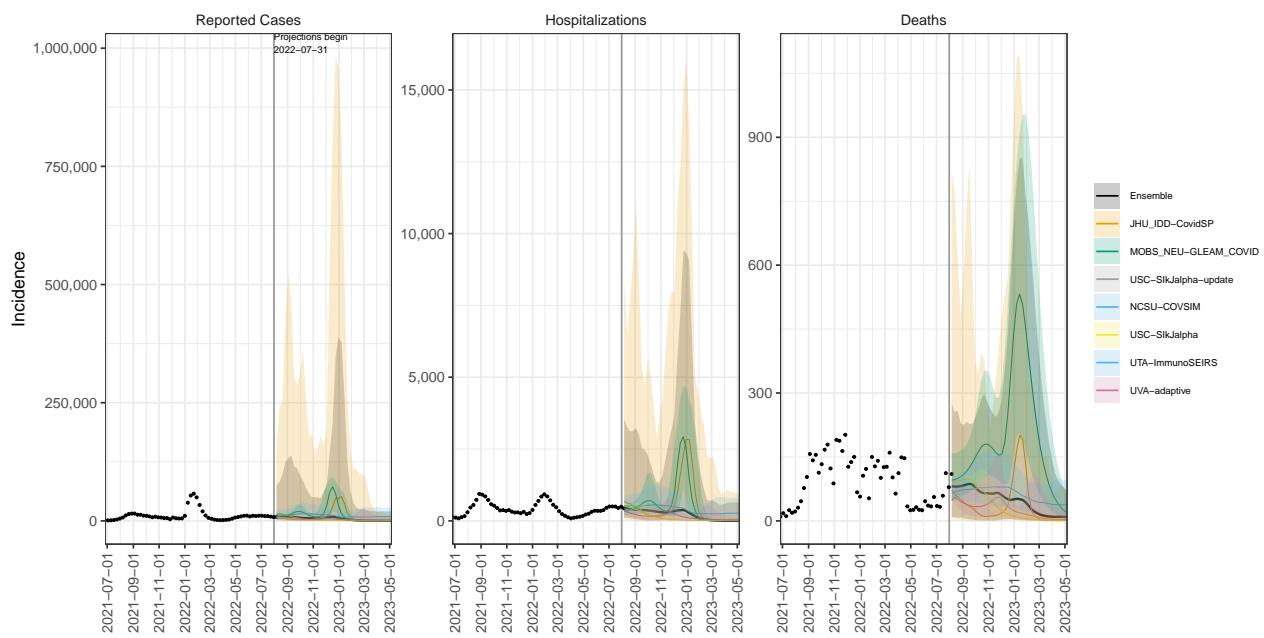
OH model variance & 95% projection intervals – Late booster, New variant



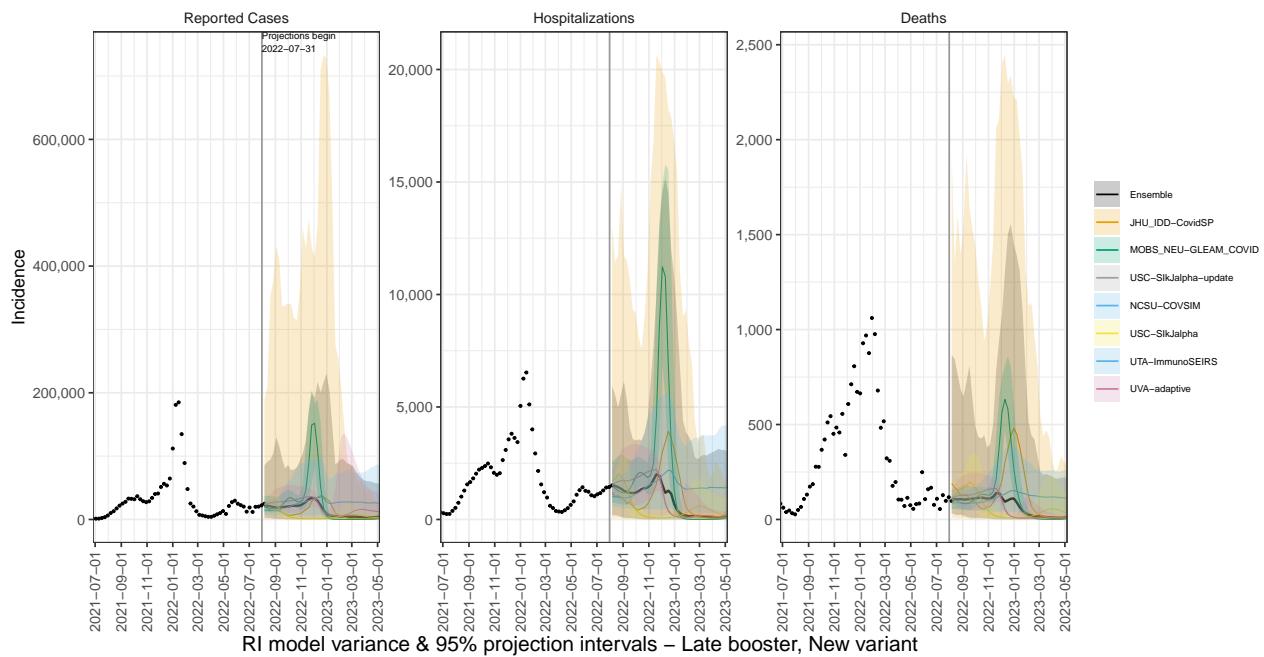
OK model variance & 95% projection intervals – Late booster, New variant



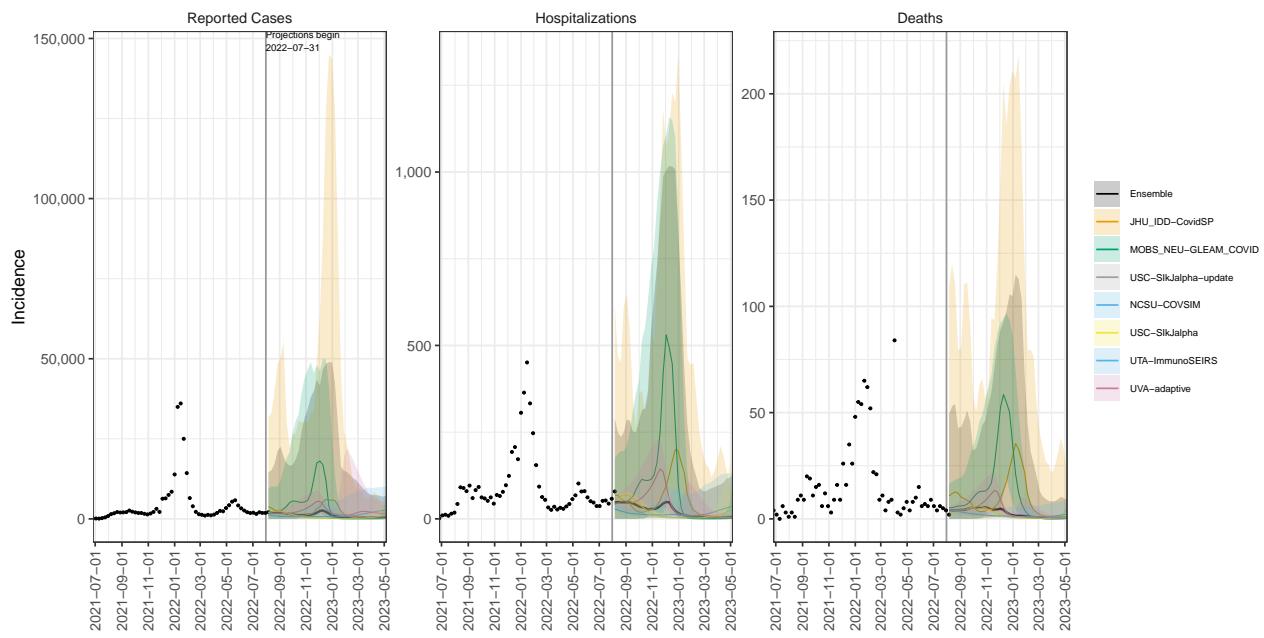
OR model variance & 95% projection intervals – Late booster, New variant



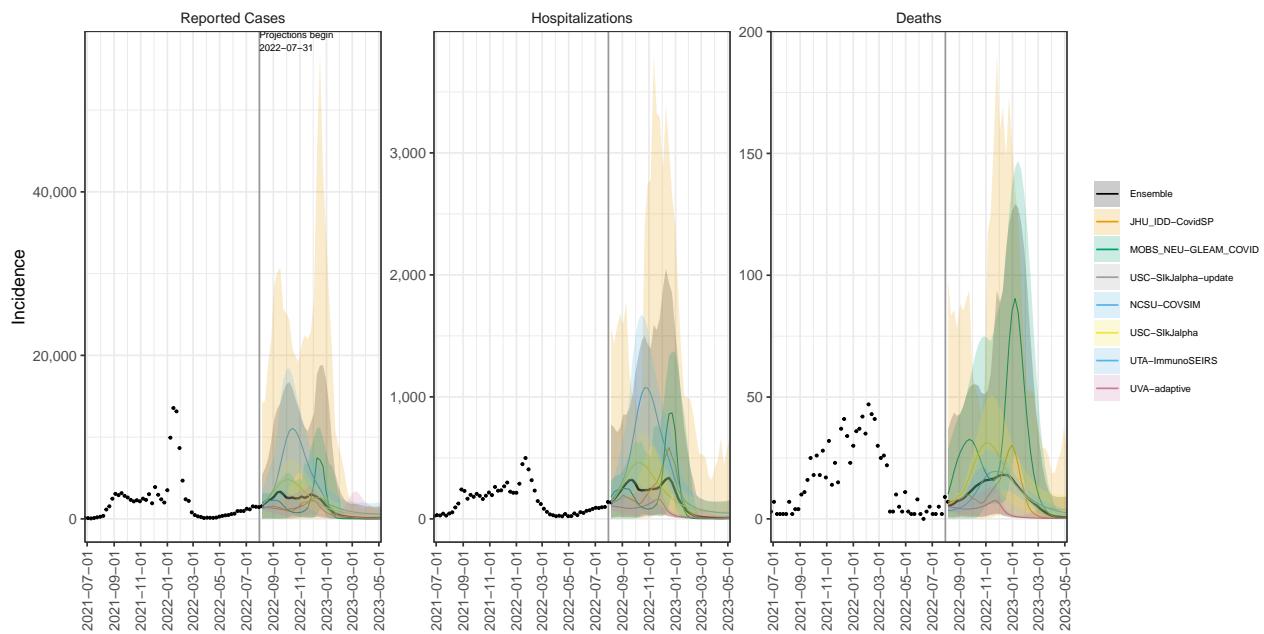
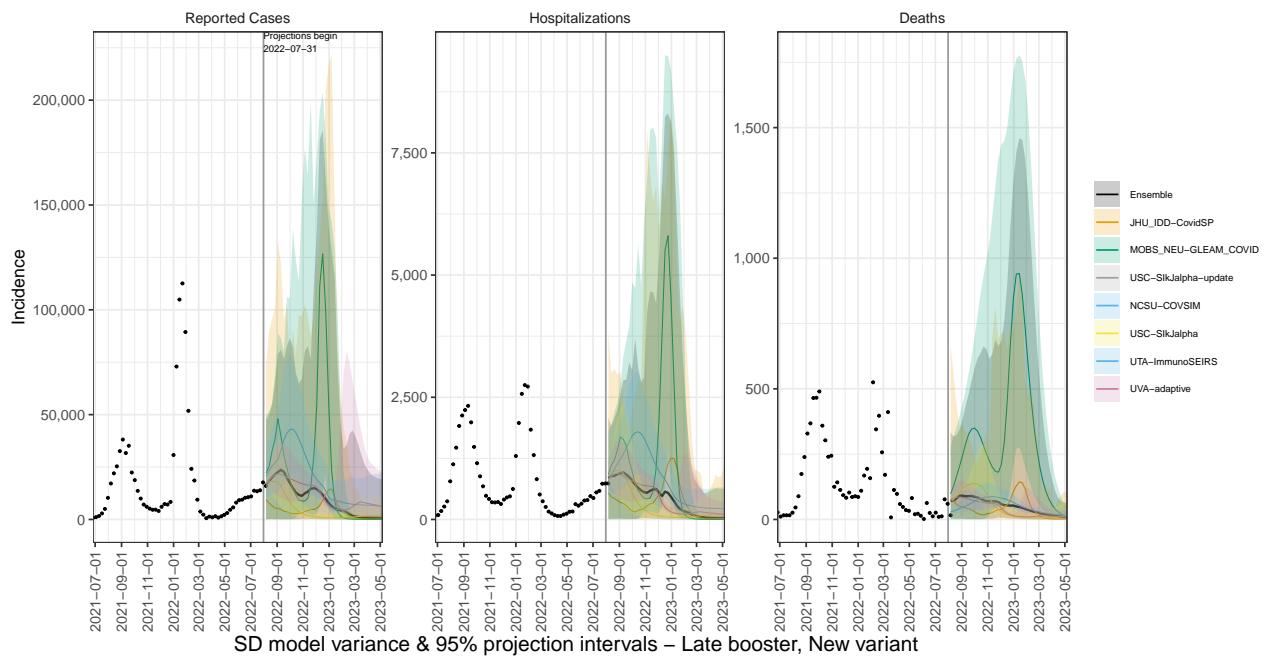
PA model variance & 95% projection intervals – Late booster, New variant



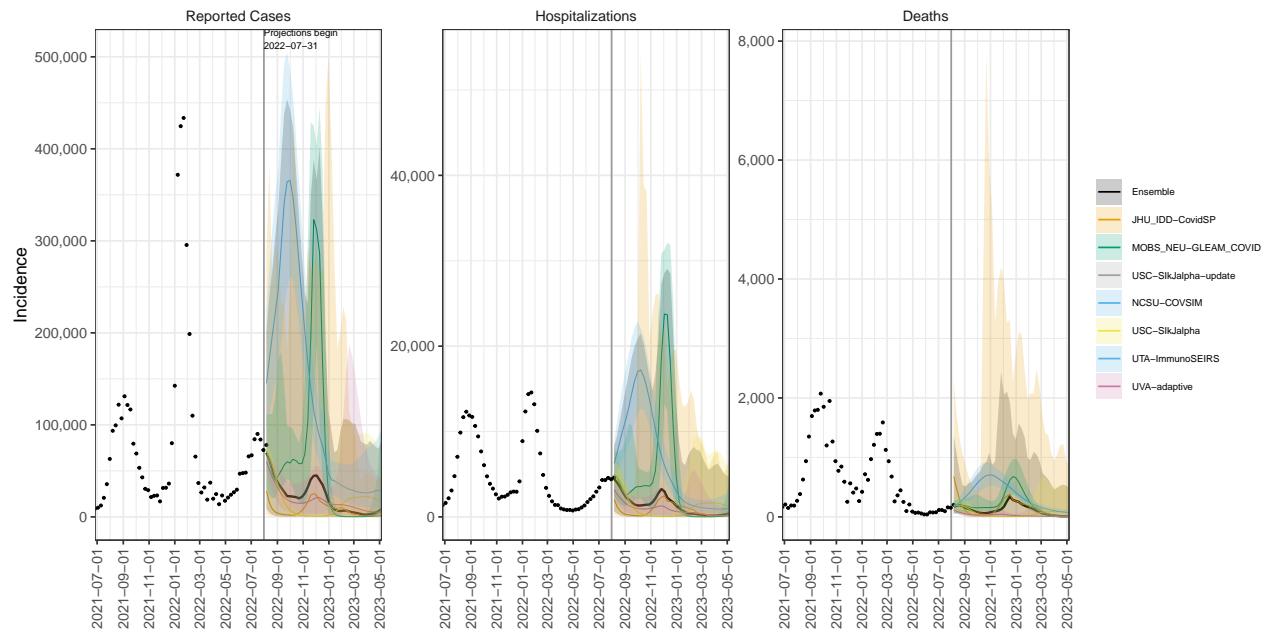
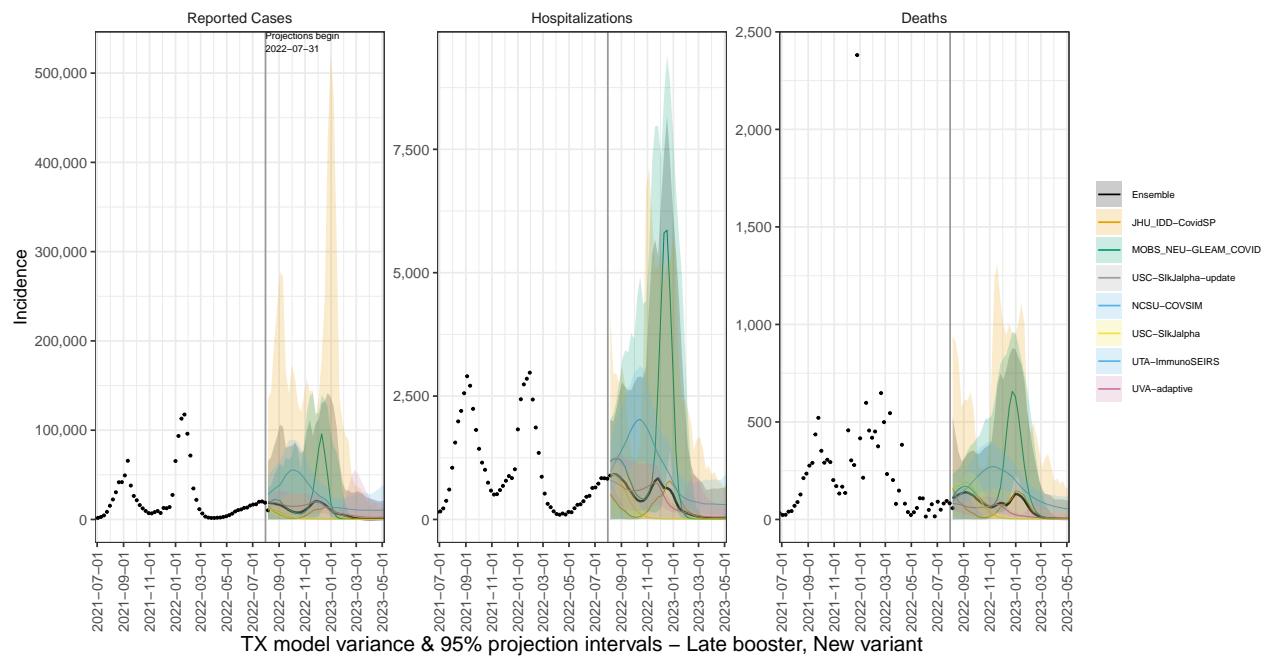
RI model variance & 95% projection intervals – Late booster, New variant



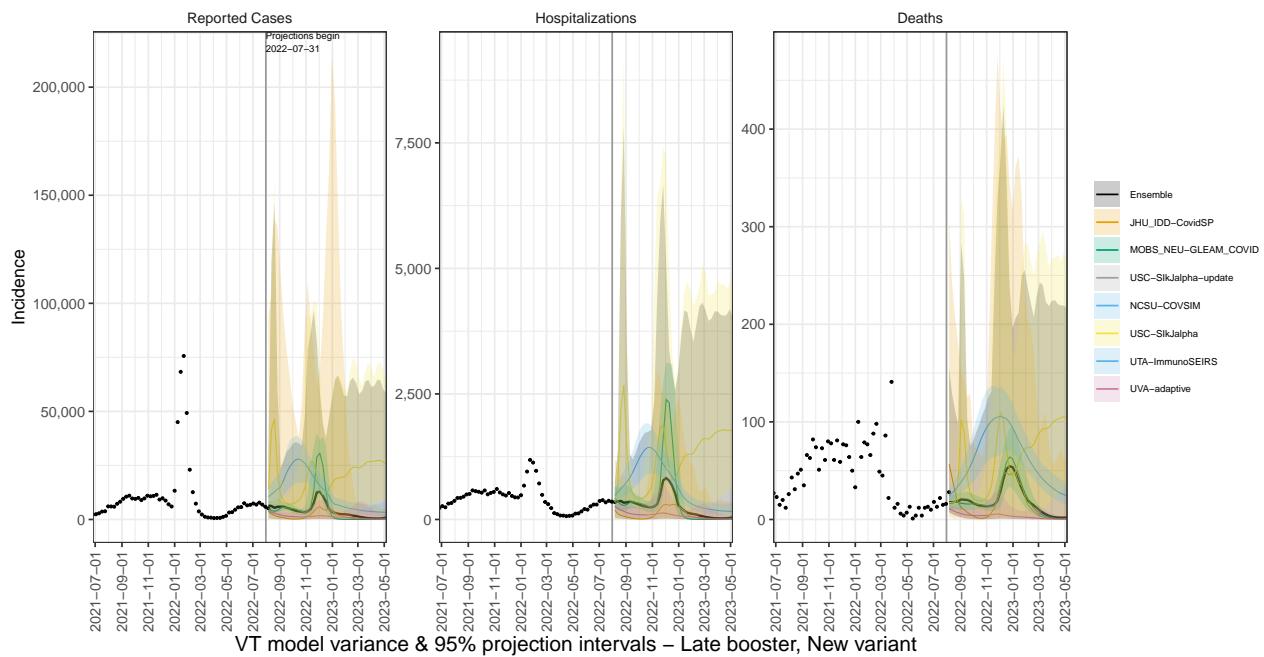
SC model variance & 95% projection intervals – Late booster, New variant



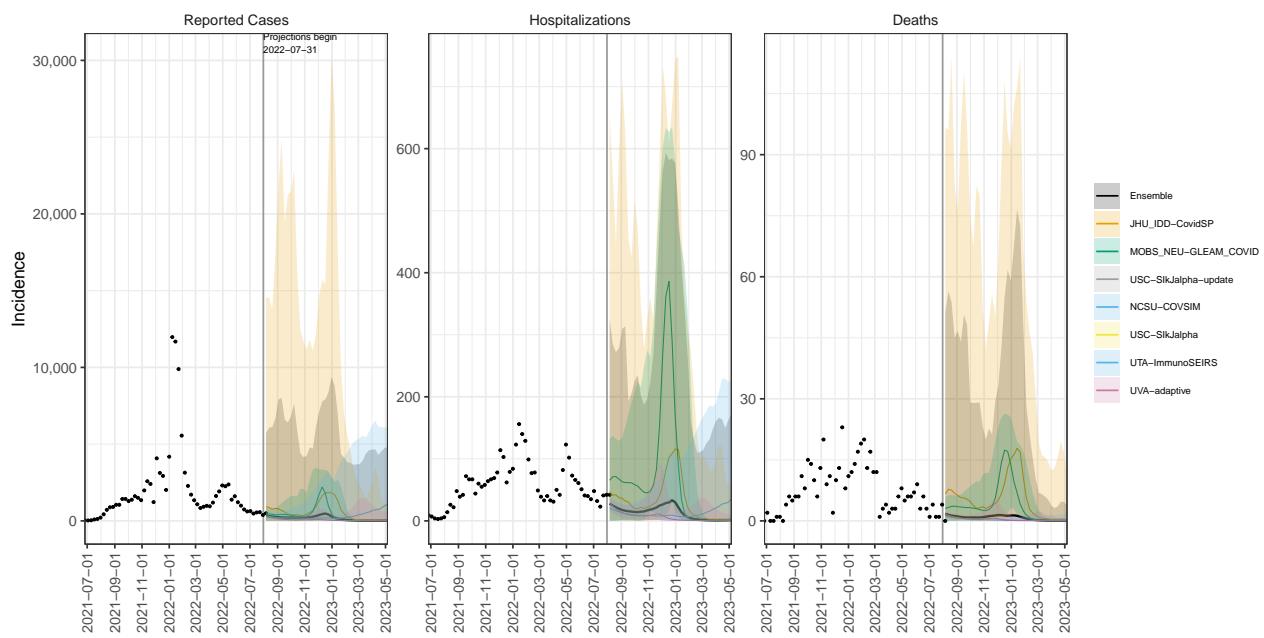
TN model variance & 95% projection intervals – Late booster, New variant



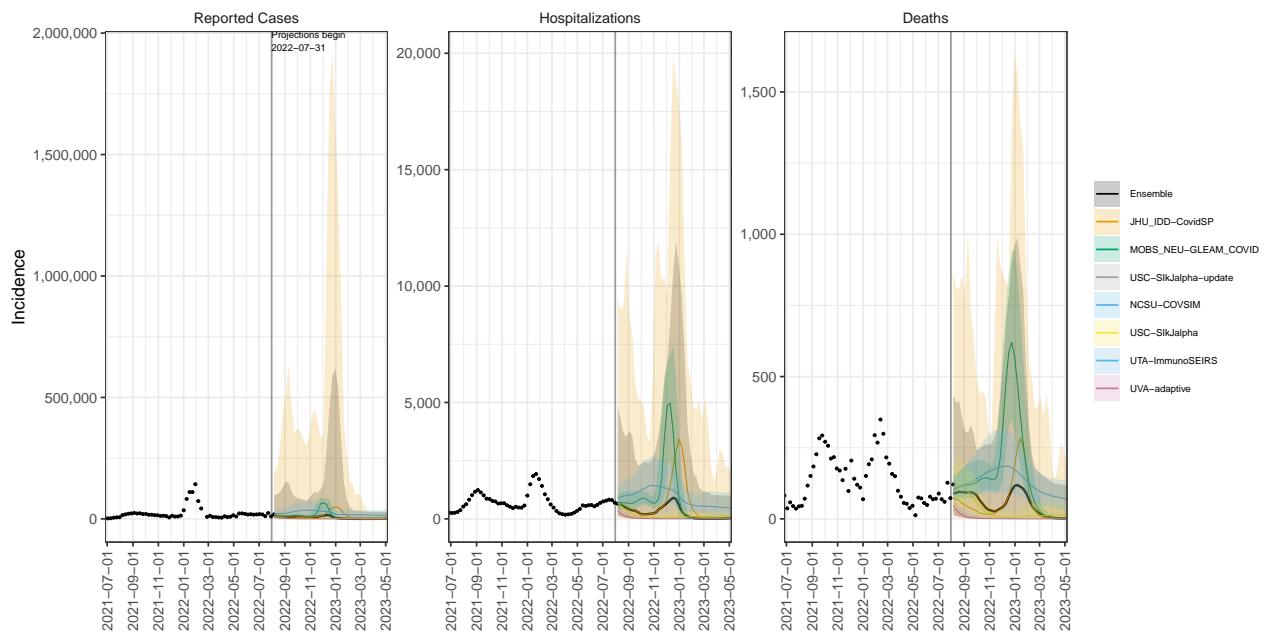
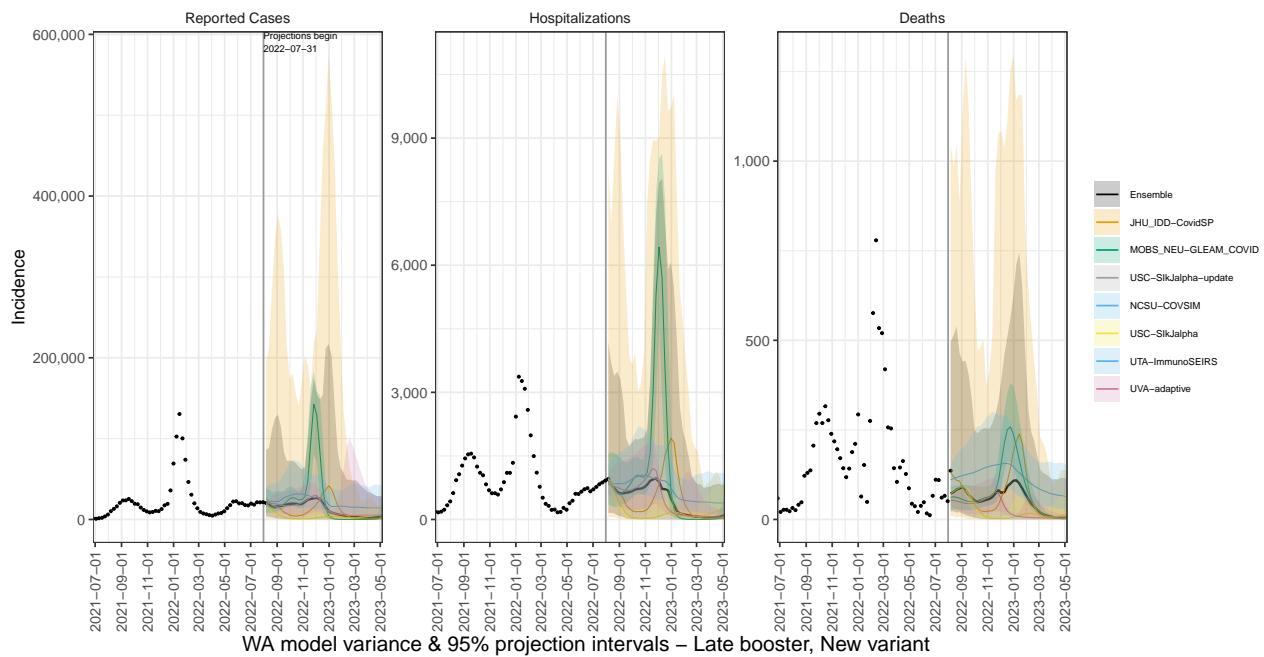
UT model variance & 95% projection intervals – Late booster, New variant



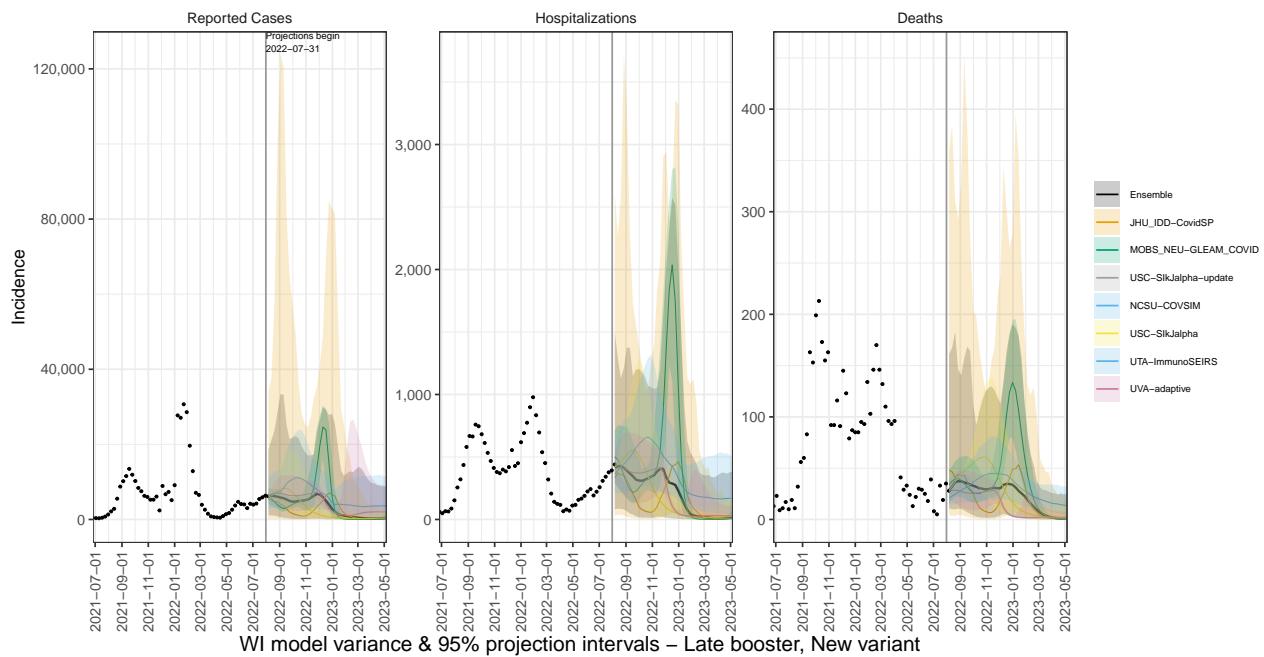
VT model variance & 95% projection intervals – Late booster, New variant



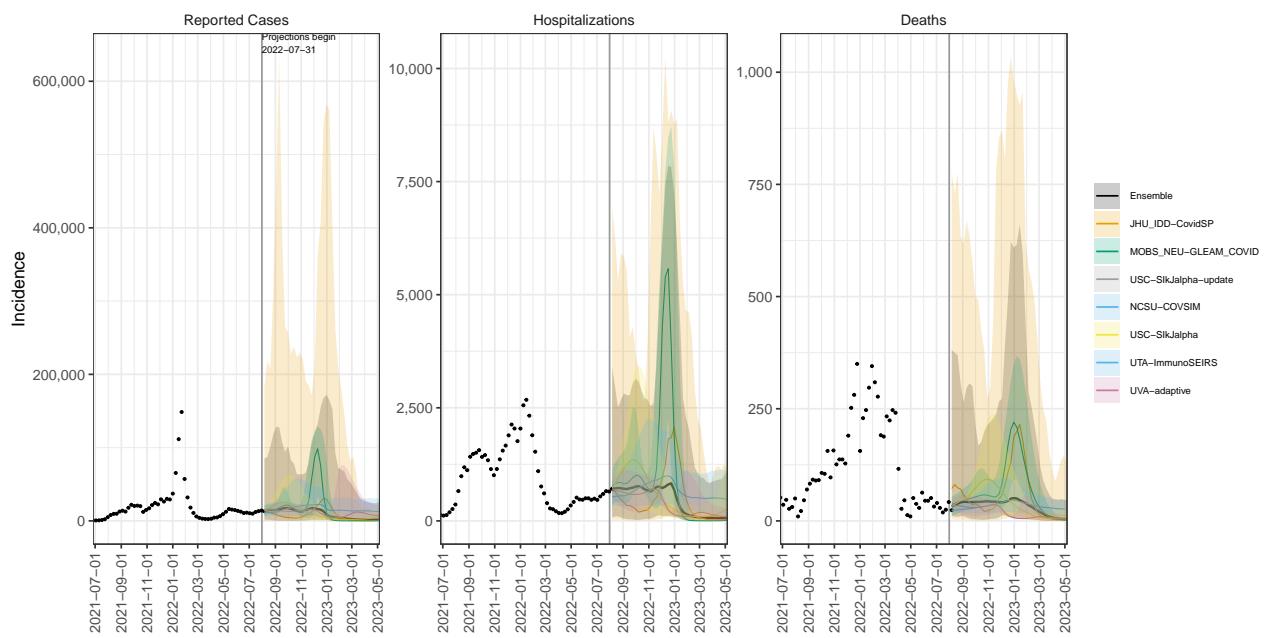
VA model variance & 95% projection intervals – Late booster, New variant



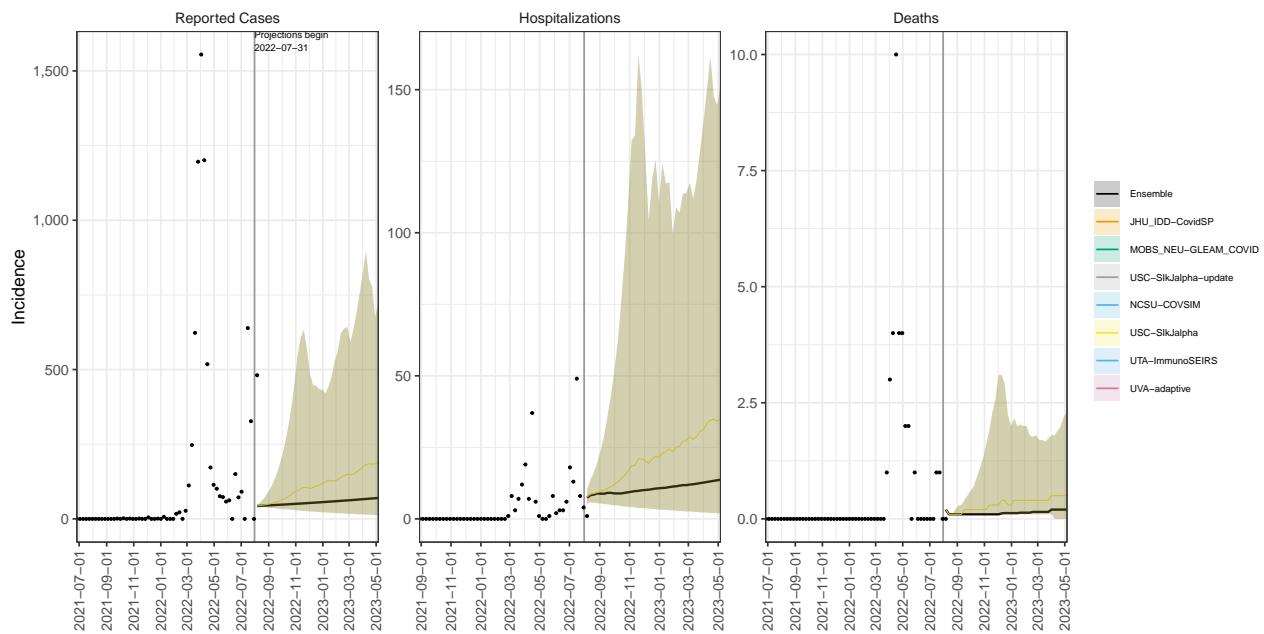
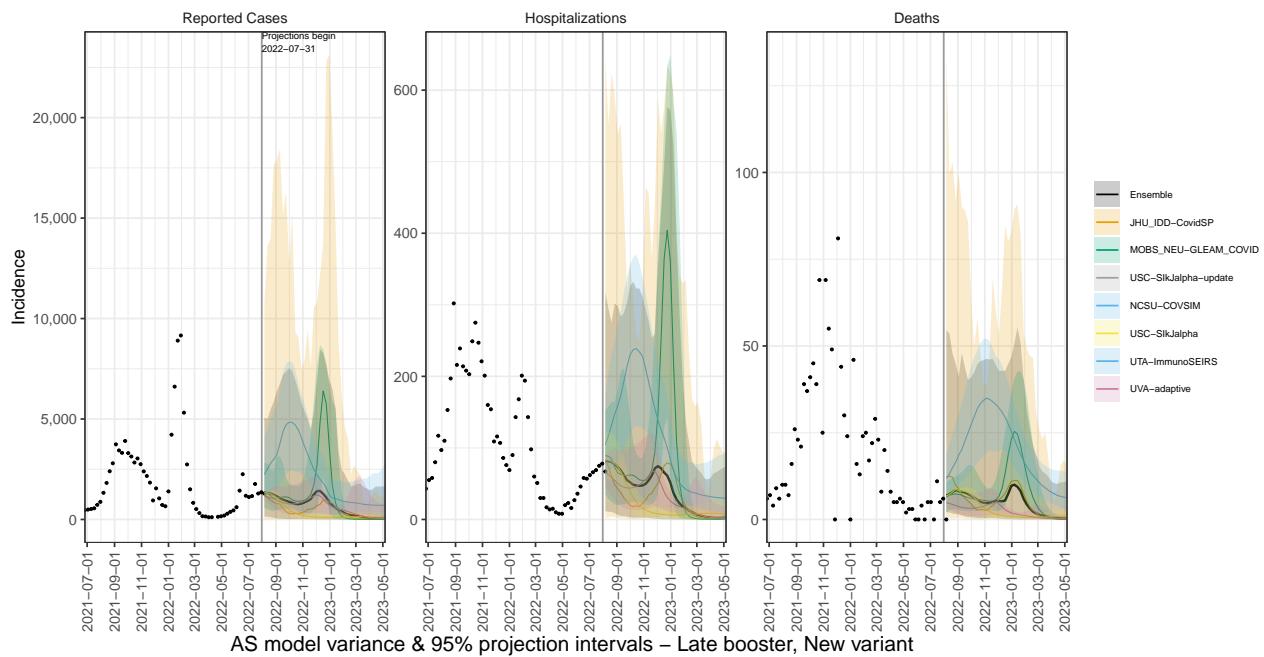
WV model variance & 95% projection intervals – Late booster, New variant



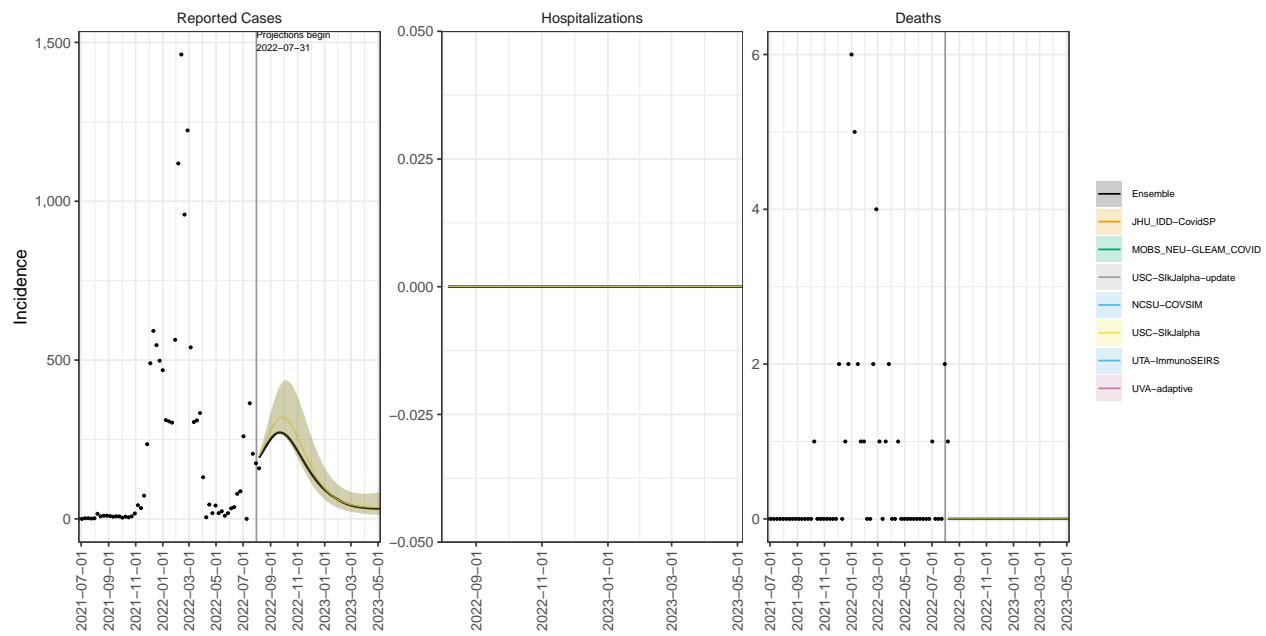
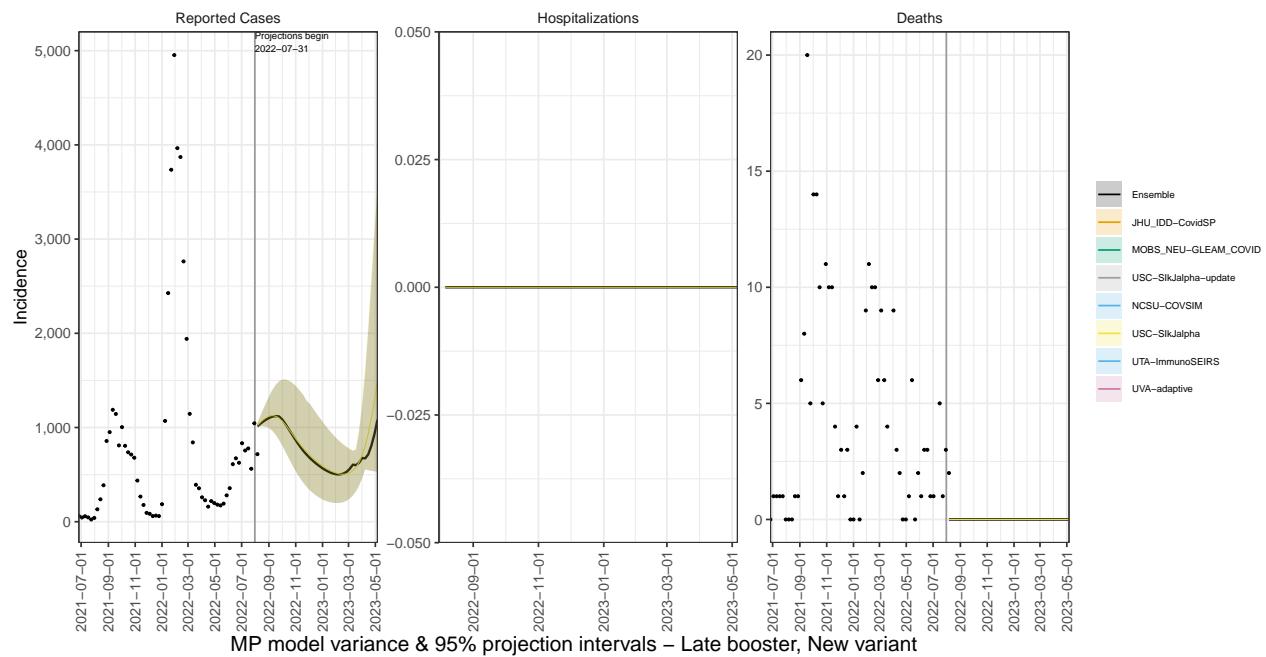
WI model variance & 95% projection intervals – Late booster, New variant

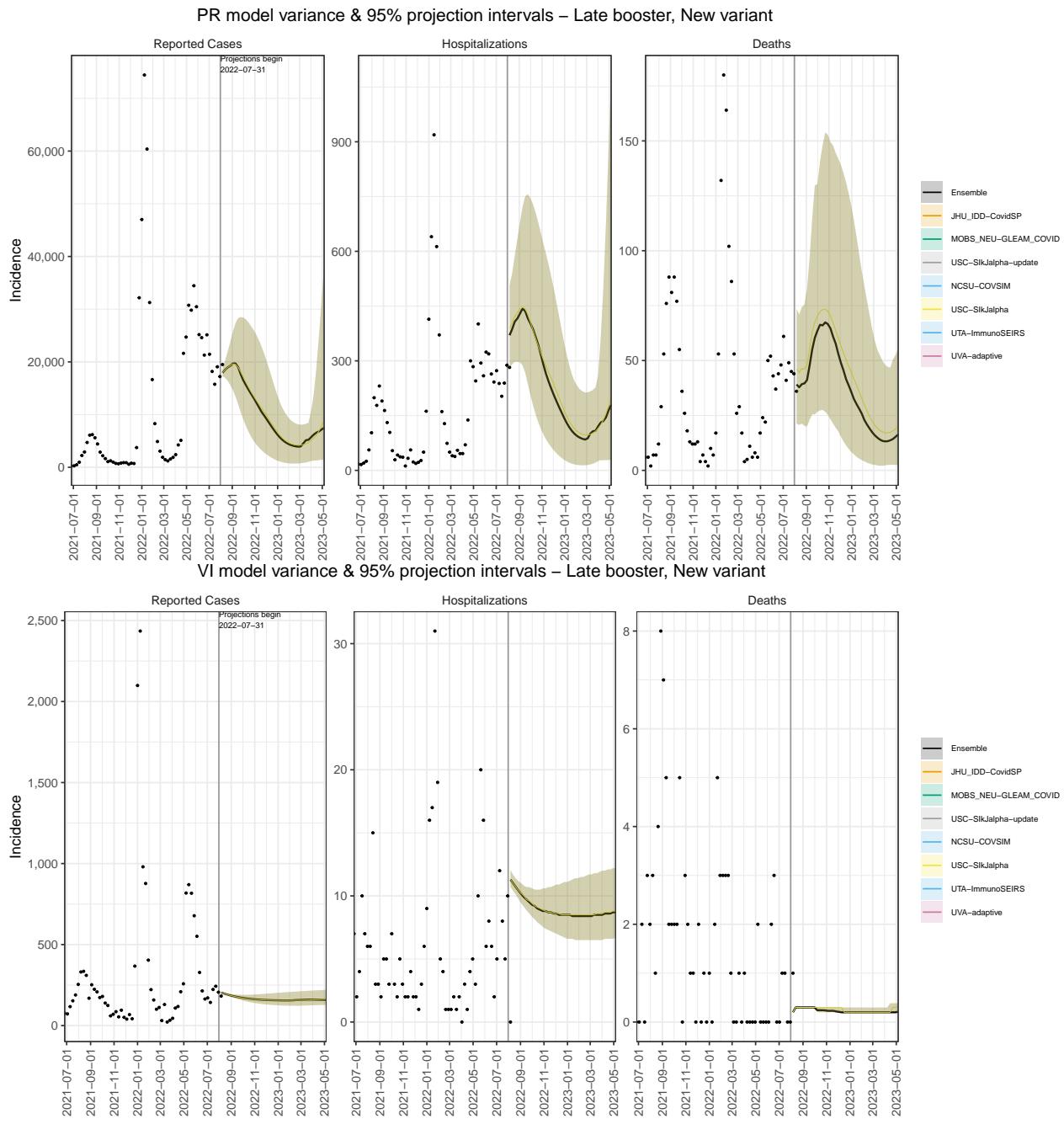


WY model variance & 95% projection intervals – Late booster, New variant



GU model variance & 95% projection intervals – Late booster, New variant





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