Eight-Week COVID19 Projections for New York City

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Note: Projections from 4/3/20 onwards included age-specific data and as such the model was likely better constrained and would better reflect the transmission dynamics, compared to our previous model projections. Additional model update from 5/8/20 onwards: the model was trained on both incidence and mortality data (combining covid-19 confirmed and probable deaths). Results in this report were generated using an age-grouped, neighborhood-level network model, and aggregated over all age groups and neighborhoods for the City.

Updates on model projections (6/6/2020):   The City is set to reopen on Monday 6/8/2020. For this week's projection, we thus updated model settings to anticipate potential changes. As no plan has been set for Phase 2 yet, for all projection scenarios, we assumed that the next 8 weeks will remain at Phase 1.

1) "As Is" scenario: We incorporated historical mobility data from SafeGraph.com to anticipate increases in mobility in the coming weeks following reopening. We assumed industries under the Phase 1 category would operate at 50% capacity during the first week, 75% during the second week, and 100% during the third and later weeks. Based on these projected mobility changes, we further projected changes in transmission rate and infectious period based on model estimates from March 1 – June 6, 2020. In addition, we in part accounted for potential reduction in transmission due to preventive measures (e.g. mask wearing). [Note: here we did not account for the recent demonstrations which could increase transmission; see the Rebound scenarios below.]

With enhanced public health interventions (e.g. the contact tracing program and onsite preventive measures), reduction in transmission rate is possible. Thus, we included 2 Control scenarios as follows:

2) "Ctrl 1 moderate reduction in transmission" scenario: 25% reduction in the transmission rate with respect to the projected estimates per the "As Is" scenario.

3) "Ctrl 2 large reduction in transmission" scenario: 50% reduction in the transmission rate with respect to the projected estimates per the "As Is" scenario.

In contrast, increase in transmission is also possible, e.g. due to mass gatherings. Thus, we included 2 Rebound scenarios as follows:

4) "Rebound 1 moderate increase in transmission" scenario: 25% increase in the transmission rate with respect to the projected estimates per the "As Is" scenario.

5) "Rebound 2 large increase in transmission" scenario: 50% increase in the transmission rate with respect to the projected estimates per the "As Is" scenario.

For more details on Methods, see README.pdf

Results – see tables (Projected Epidemic Outcomes and Healthcare Demands etc.) in WeeklyProjections.xlsx and DailyProjections.xlsx; see figures below.
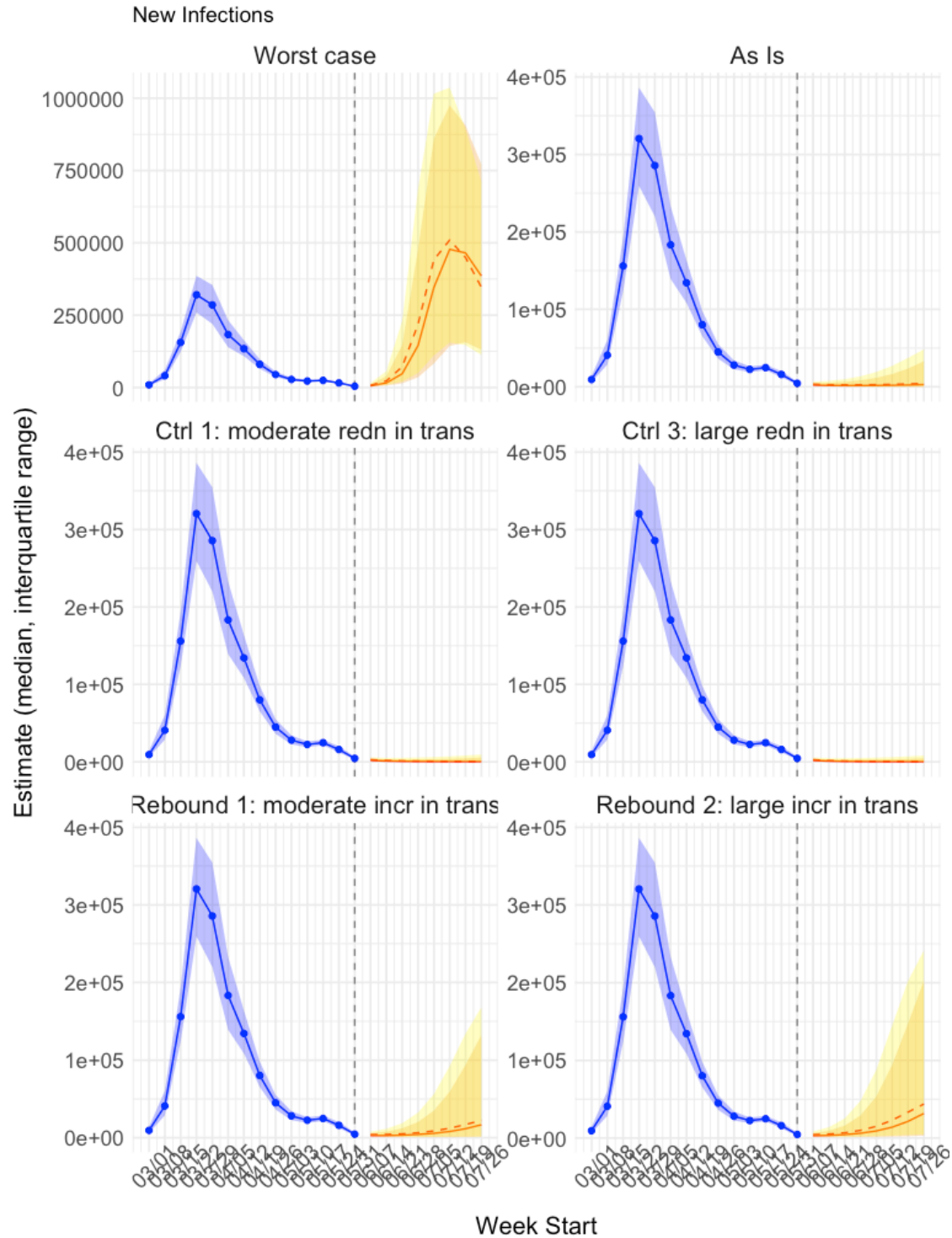
Some observations based on COVID19 data up to 6/5/2020:

1) As the City enters Phase 1 reopening on 6/8, mobility and person-to-person contact will increase and transmission may increase as a result. Under the updated "As Is" scenario, the projected reproductive number (Rt) is near 1. Thus, the number of new infections would level off in the first ~3 weeks following reopening and could increase slightly afterwards when Phase 1 industries operate at full capacity.

2) Enhanced public health interventions could reduce transmission and keep Rt < 1 to prevent surges in infections. Thus, in addition to testing and contact tracing, it is crucial to maintain social distancing measures, face mask wearing, and other onsite preventive measures (e.g. avoid workplace crowding and deep cleaning).

3) Transmission could intensify during mass gatherings (e.g. demonstrations) and as a result push Rt to above unity. If so, the number of infections could increase substantially, as projected under the two Rebound scenarios (see figures below).
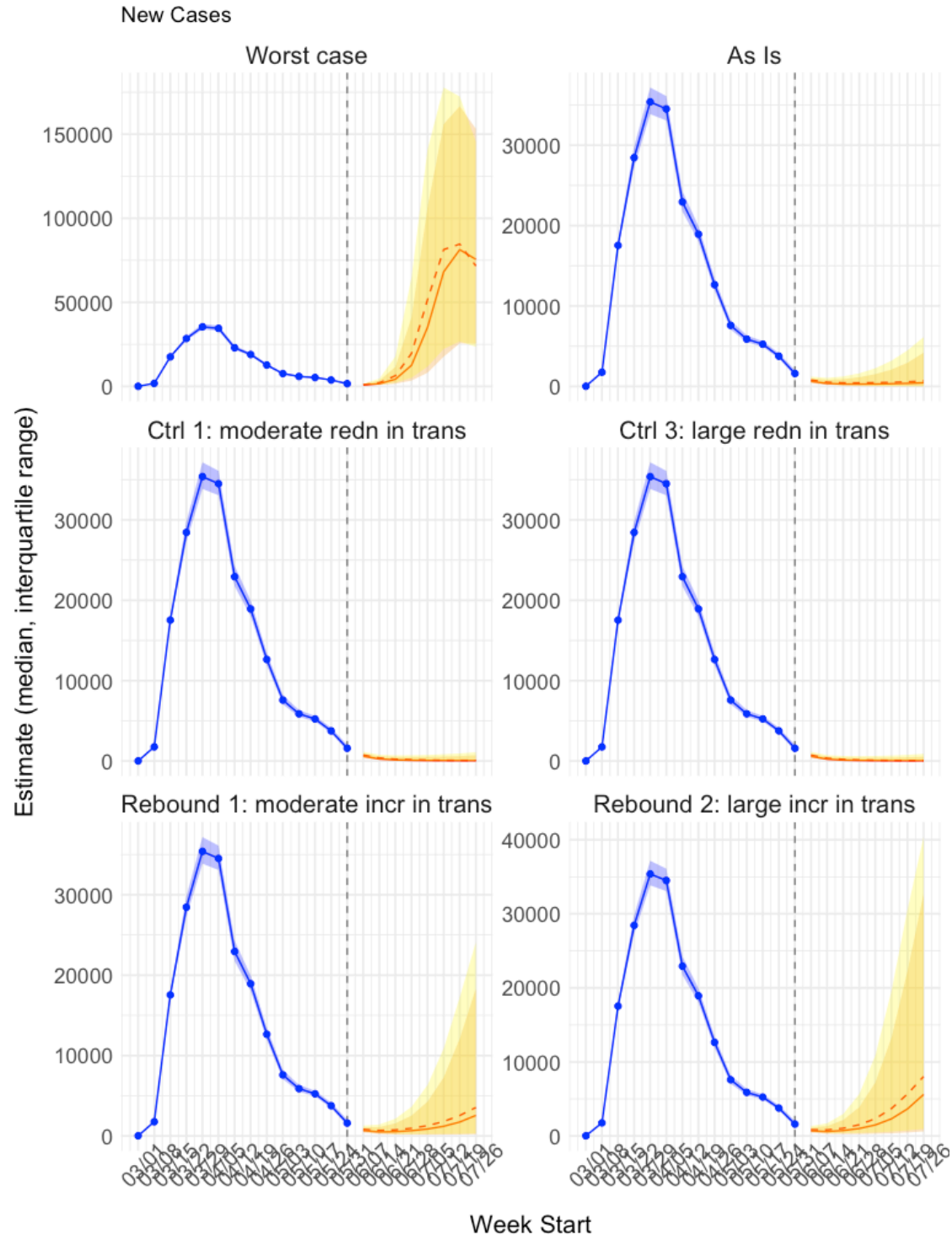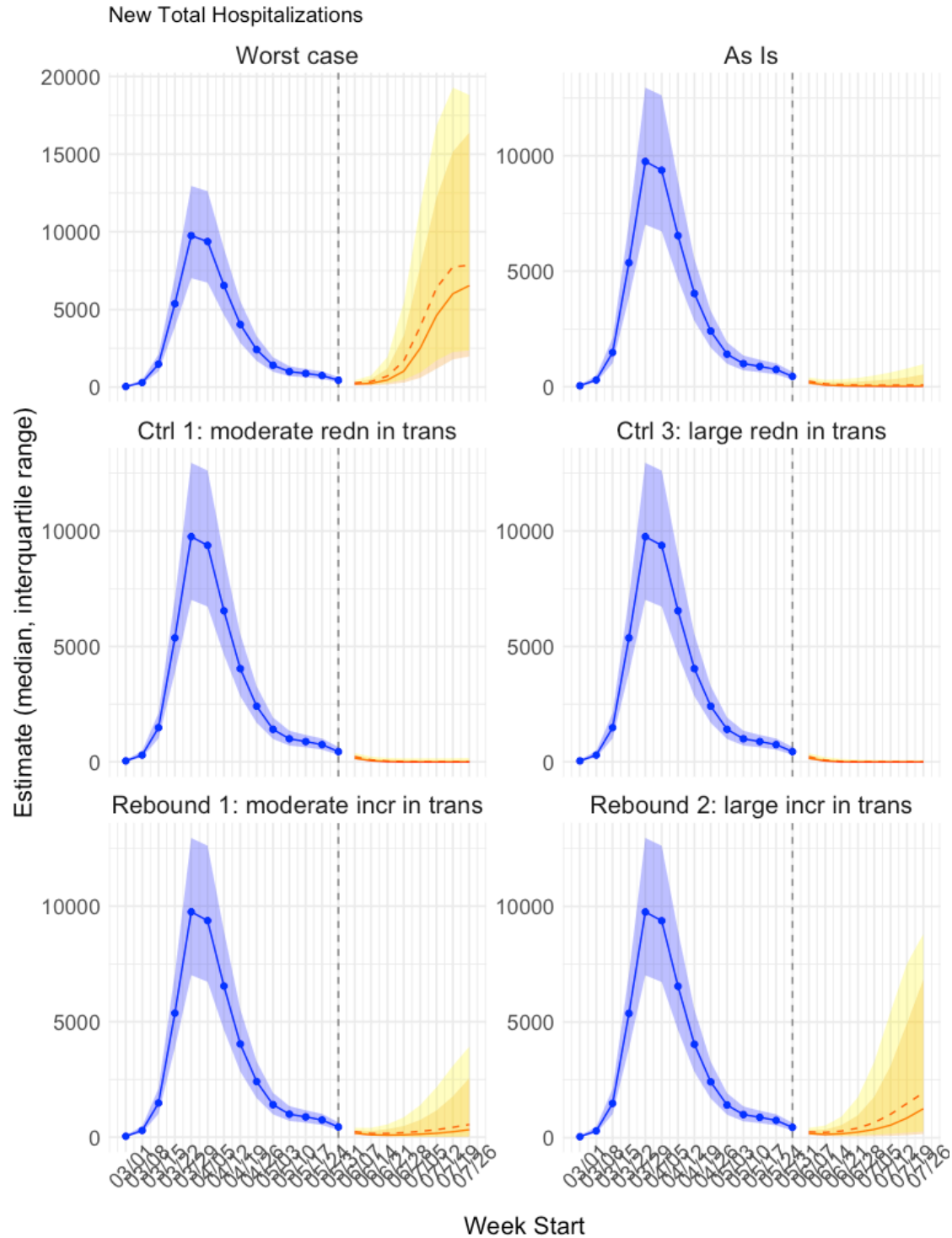
Caution: Please note that there are large uncertainties in our model projections due to unknown disease transmission dynamics (model misspecification), changing behavior and policies, delay in reporting, and under-reporting. In particular, the data our projections are based on reflect situations ~2 weeks ago due to time lags from interventions implemented to transmission events (a couple days to weeks), from infection to symptom onset (~2-6 days), from symptom onset to seeking treatment (~2-7 days), from seeking treatment to getting tested and then reported in the surveillance system (~2-7 days). In addition, how the epidemic would unfold also depend largely on behavior changes over time.
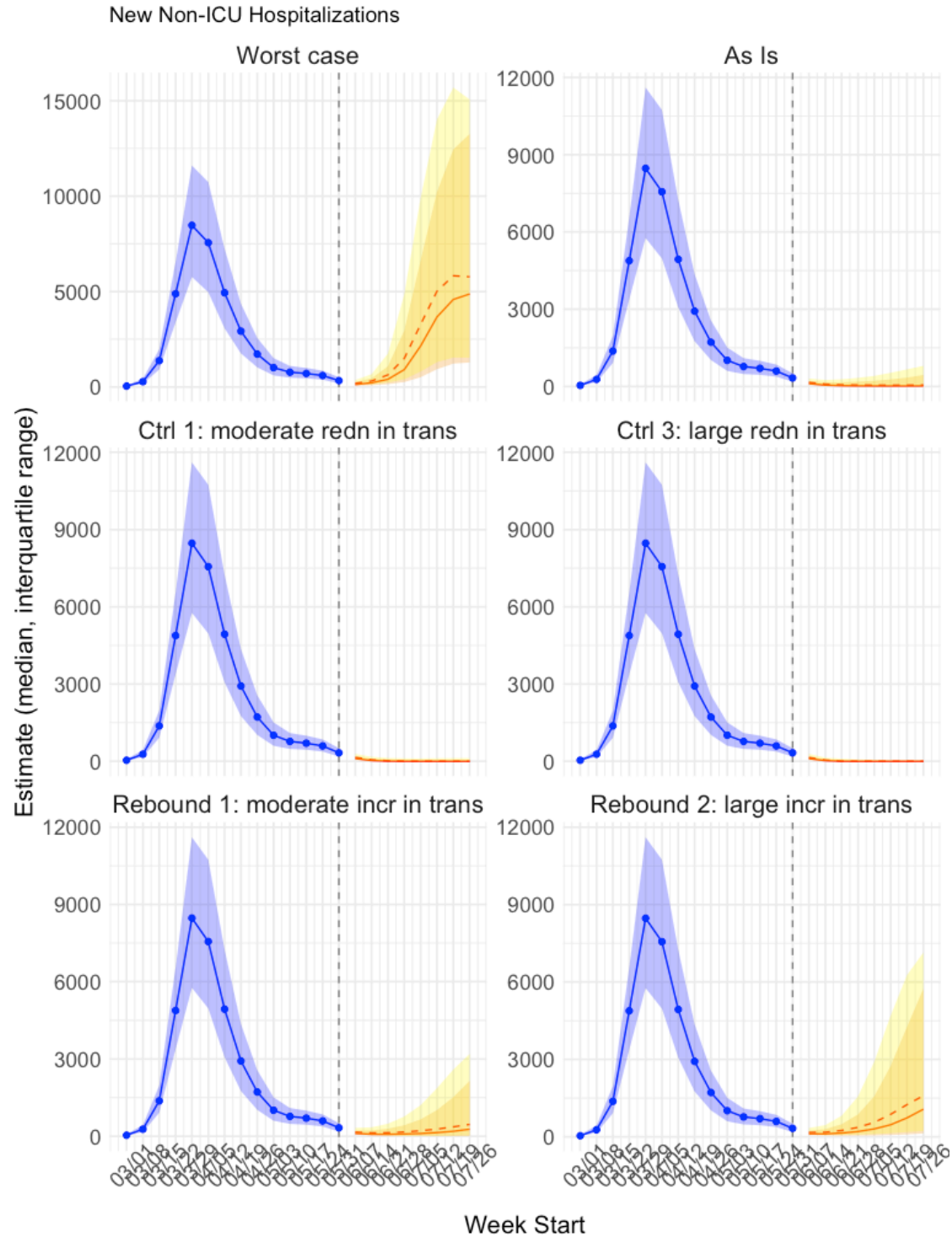
New Infections

Projected number for the next 8 weeks under different control scenarios.
Blue lines and points show median estimates for the model training period;
red lines show projected median numbers with seasonality (solid lines) or
without seasonality (dashed lines); shaded regions shown the interquartile
ranges (IQR) for model estimates with seasonality (in orange) or without
seasonality (in yellow). Dates are the first day (i.e. Sunday) of the week.
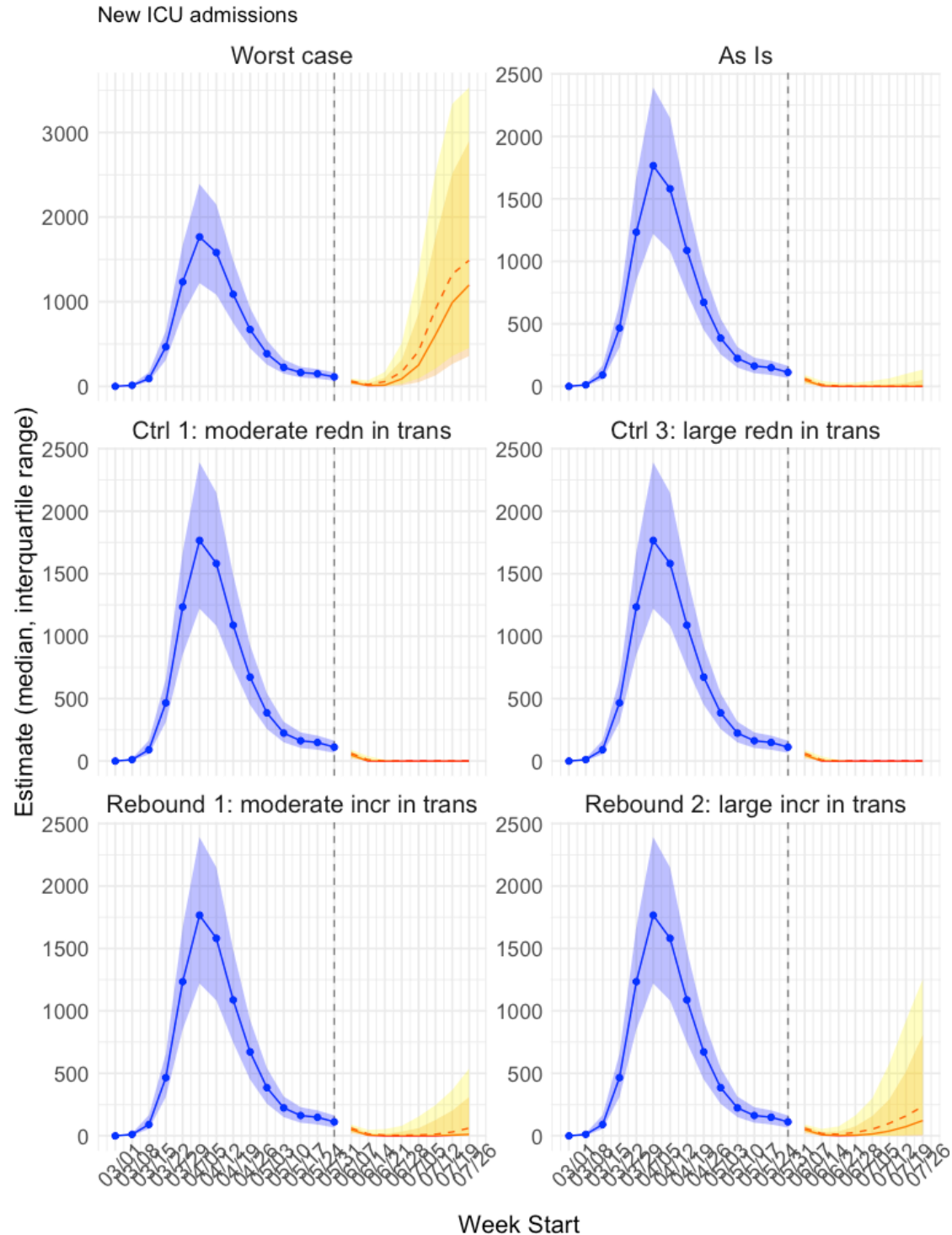
New Cases

Projected number for the next 8 weeks under different control scenarios.
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New Total Hospitalizations

Projected number for the next 8 weeks under different control scenarios.
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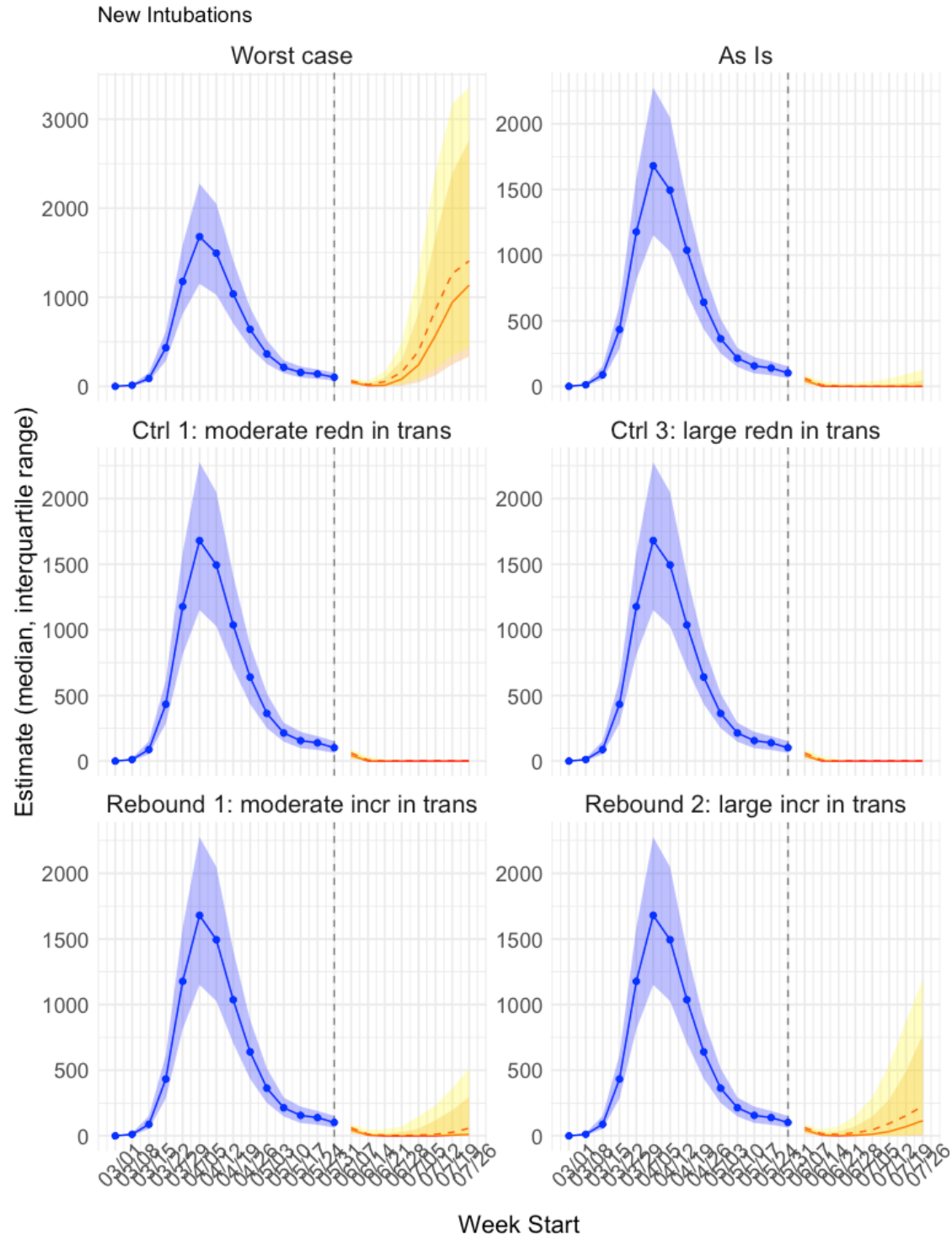
New Non-ICU Hospitalizations

Projected number for the next 8 weeks under different control scenarios.
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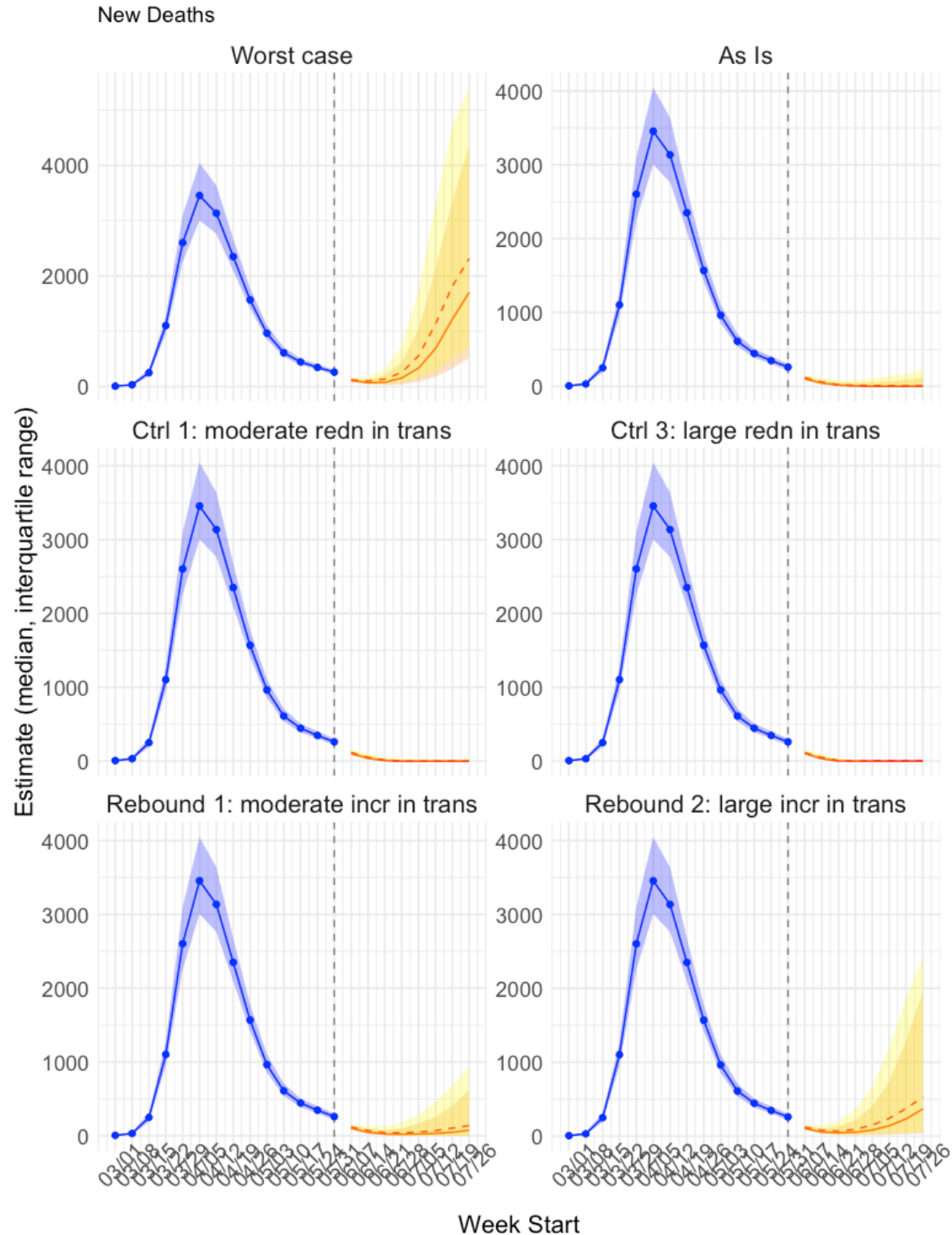
New ICU admissions

Projected number for the next 8 weeks under different control scenarios.
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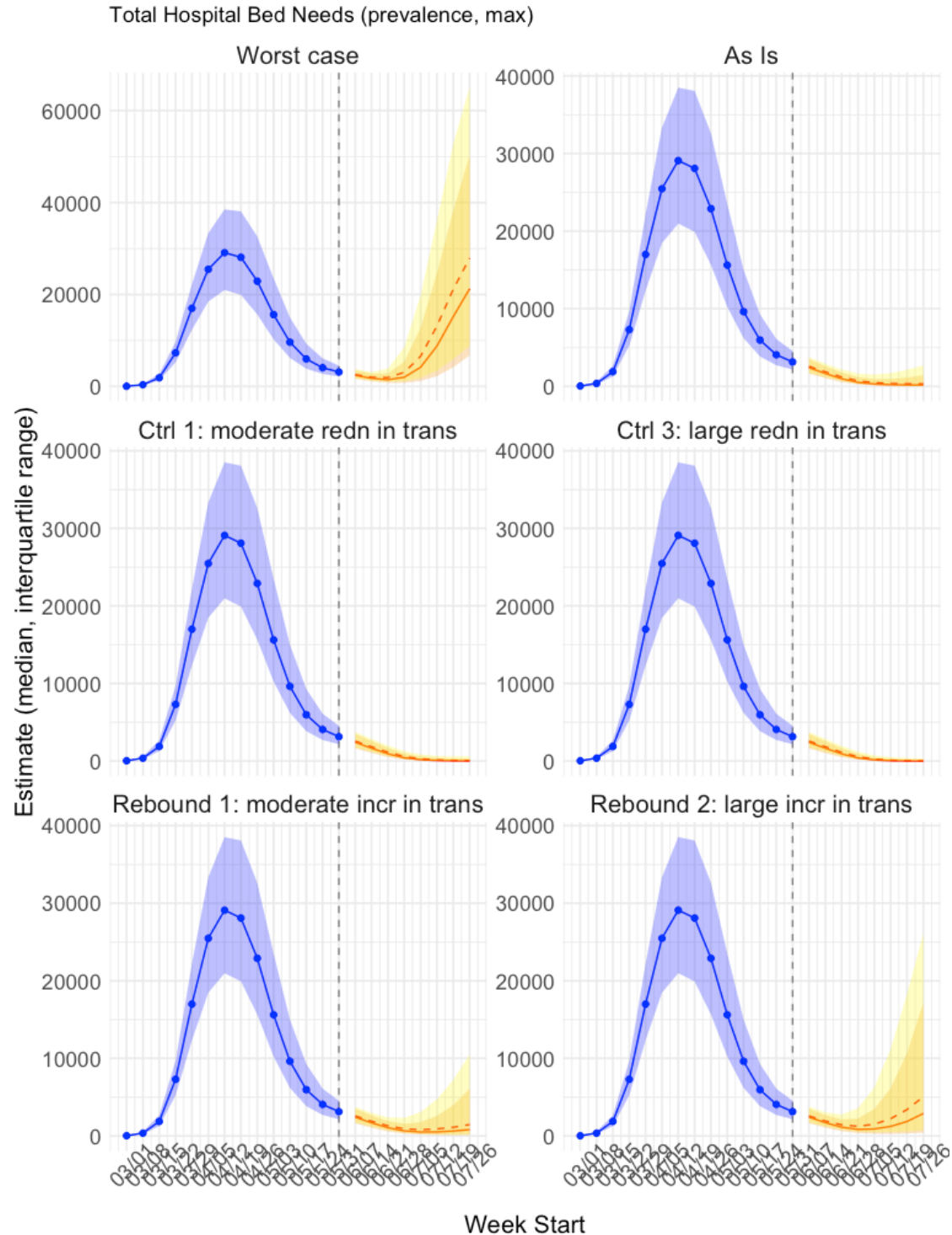
New Intubations

Projected number for the next 8 weeks under different control scenarios.
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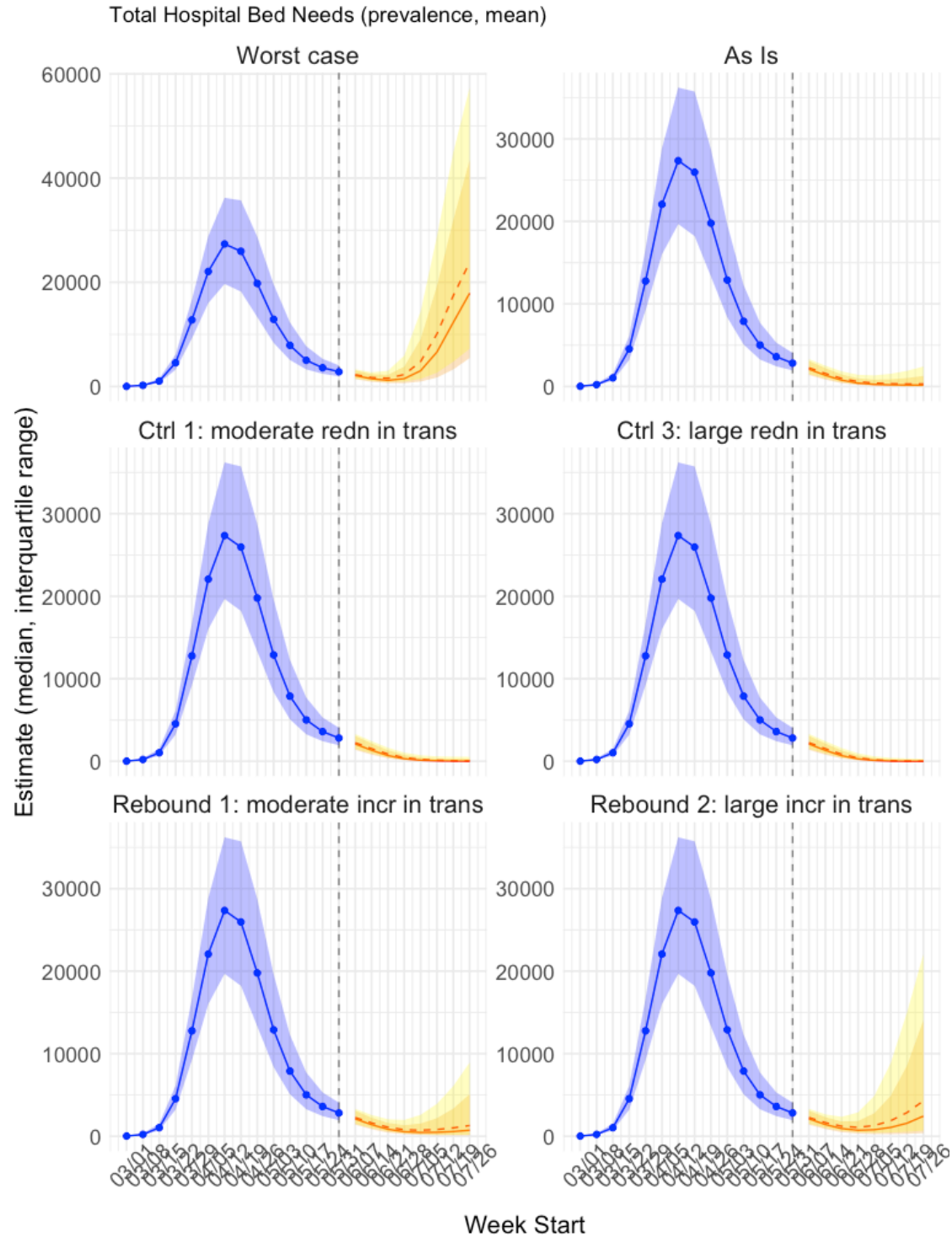
New Deaths

Projected number for the next 8 weeks under different control scenarios.
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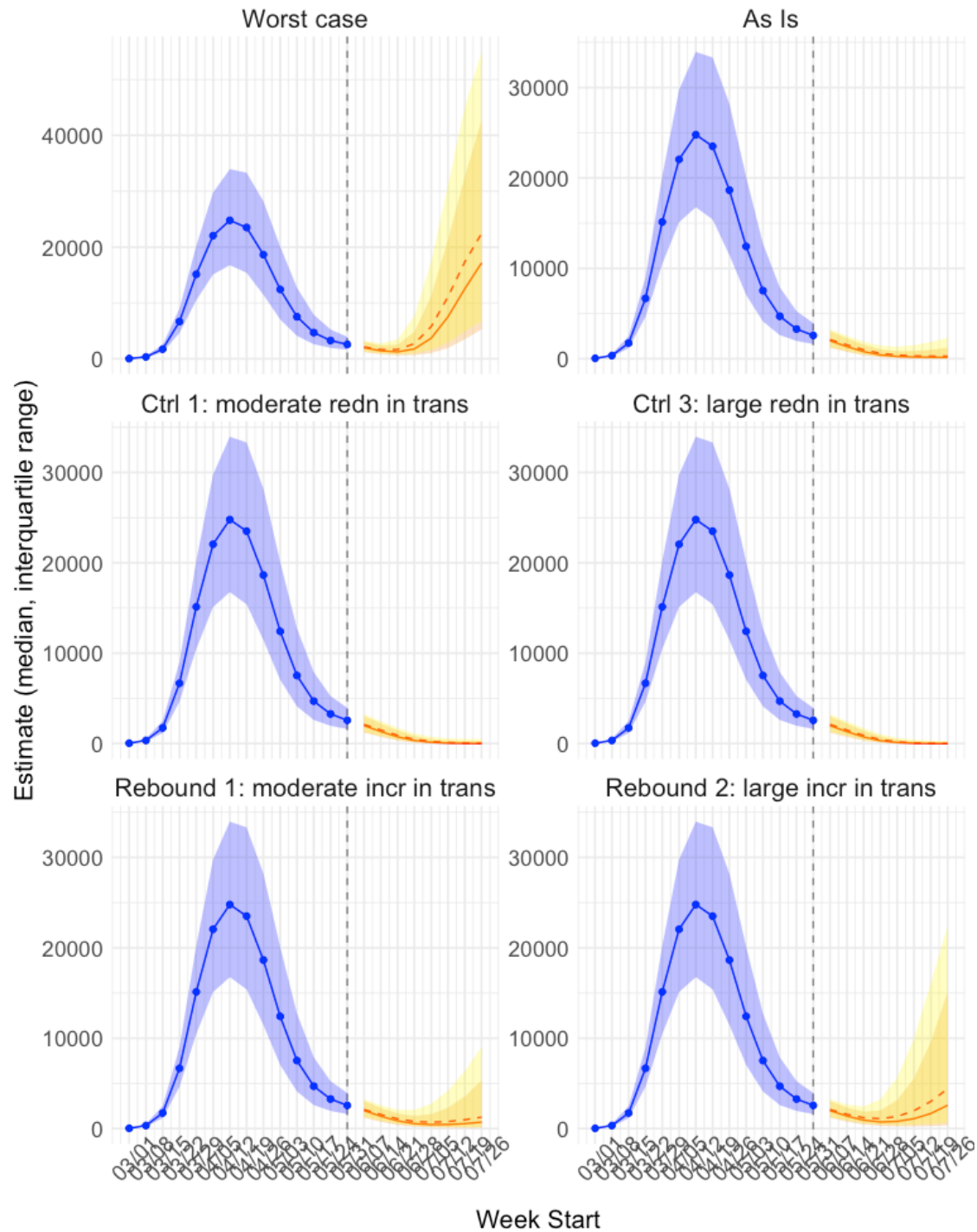
Total Hospital Bed Needs (prevalence, max)

Projected number for the next 8 weeks under different control scenarios.
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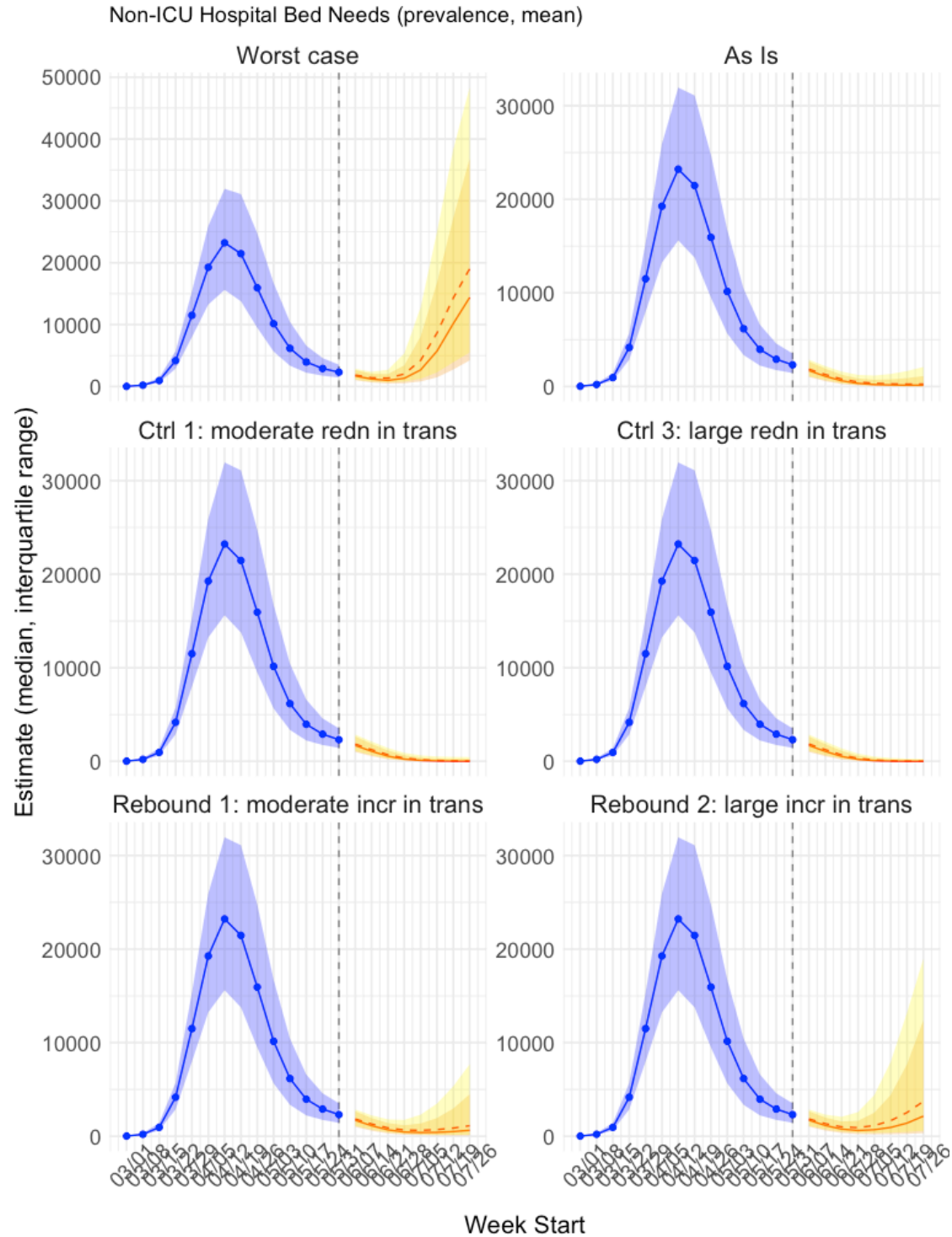
Total Hospital Bed Needs (prevalence, mean)

Projected number for the next 8 weeks under different control scenarios.
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Non-ICU Hospital Bed Needs (prevalence, max)

Projected number for the next 8 weeks under different control scenarios.
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without seasonality (dashed lines); shaded regions shown the interquartile
ranges (IQR) for model estimates with seasonality (in orange) or without
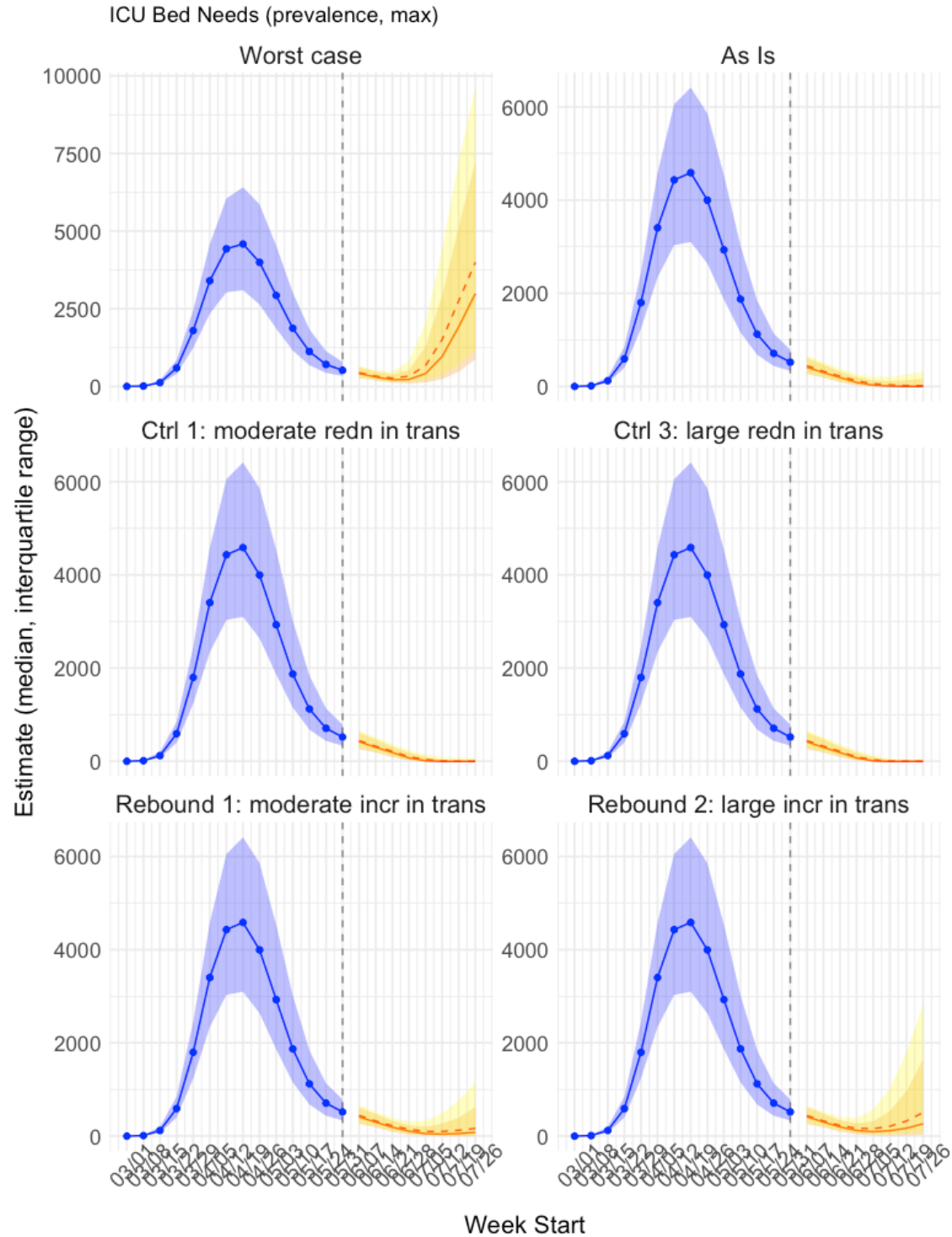seasonality (in yellow). Dates are the first day (i.e. Sunday) of the week.

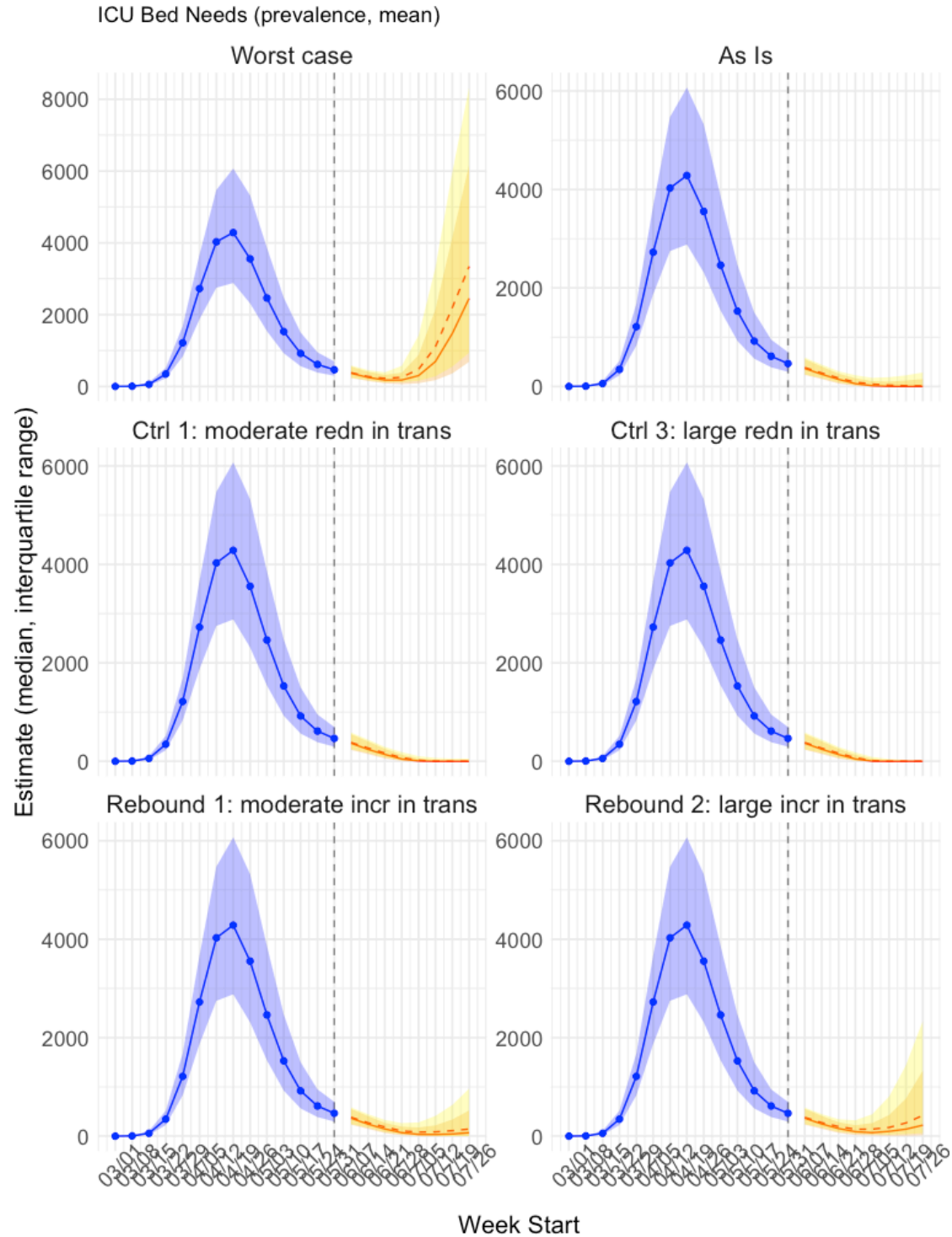## Non-ICU Hospital Bed Needs (prevalence, mean)

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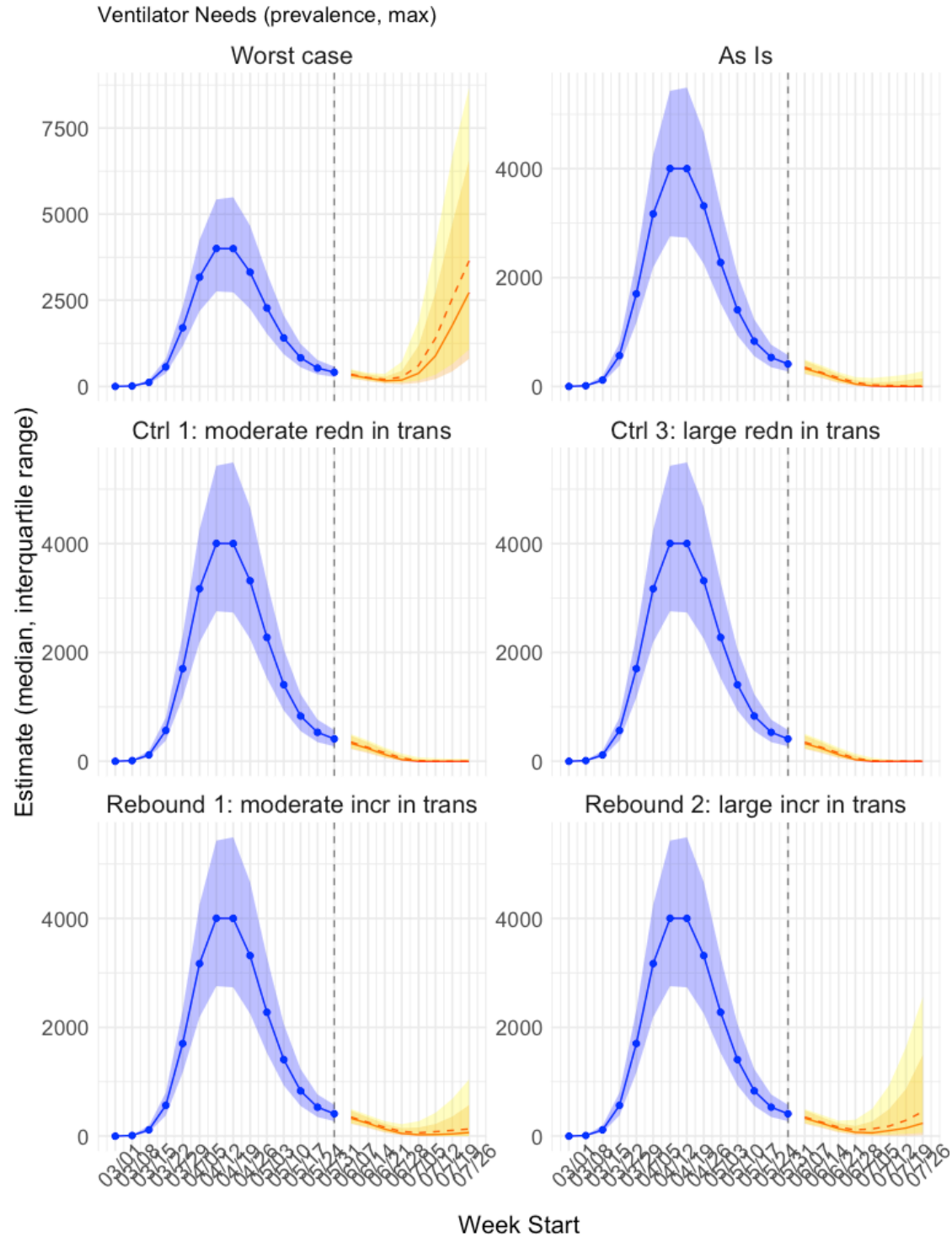
ICU Bed Needs (prevalence, max)

Projected number for the next 8 weeks under different control scenarios.
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ICU Bed Needs (prevalence, mean)

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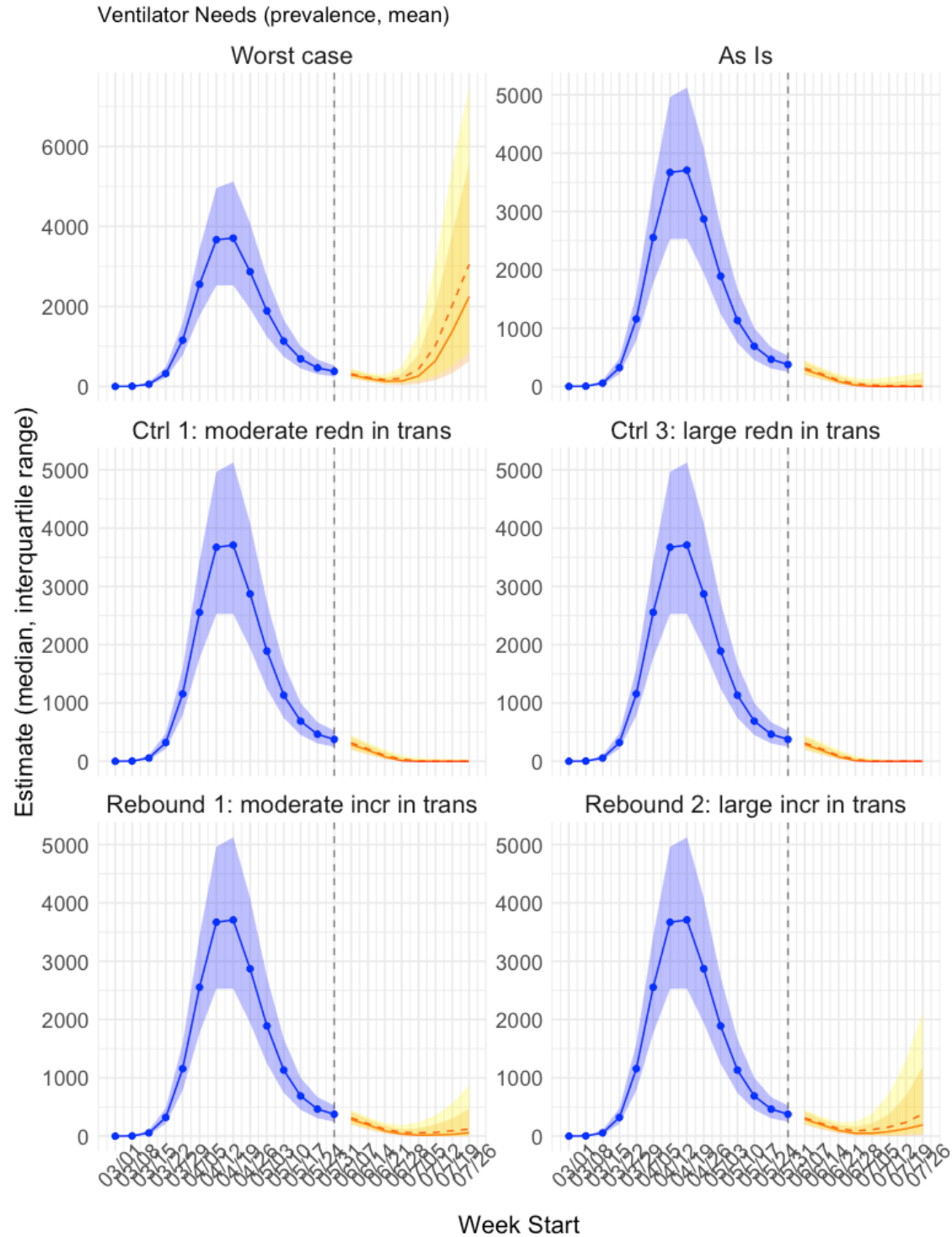
Ventilator Needs (prevalence, max)

Projected number for the next 8 weeks under different control scenarios.
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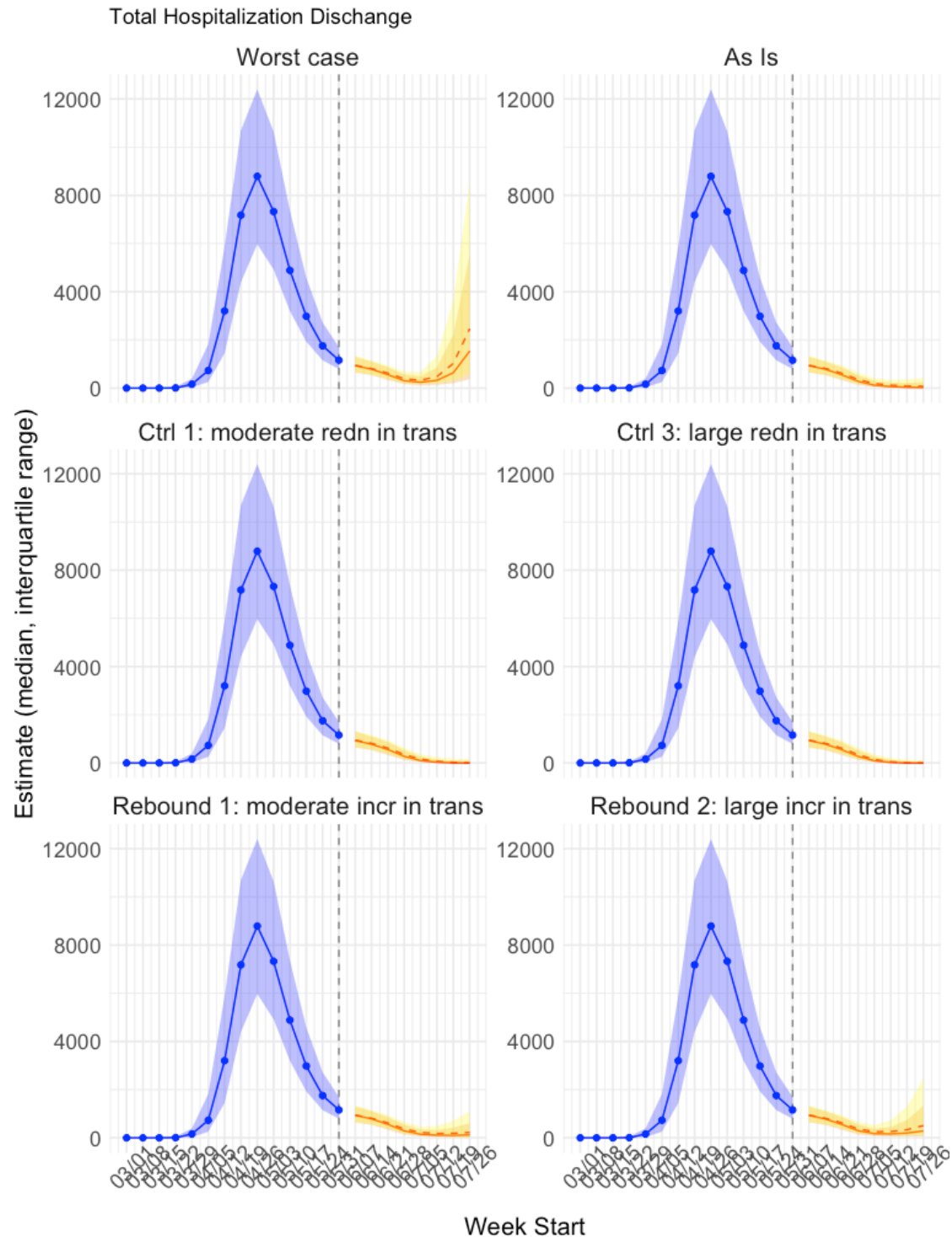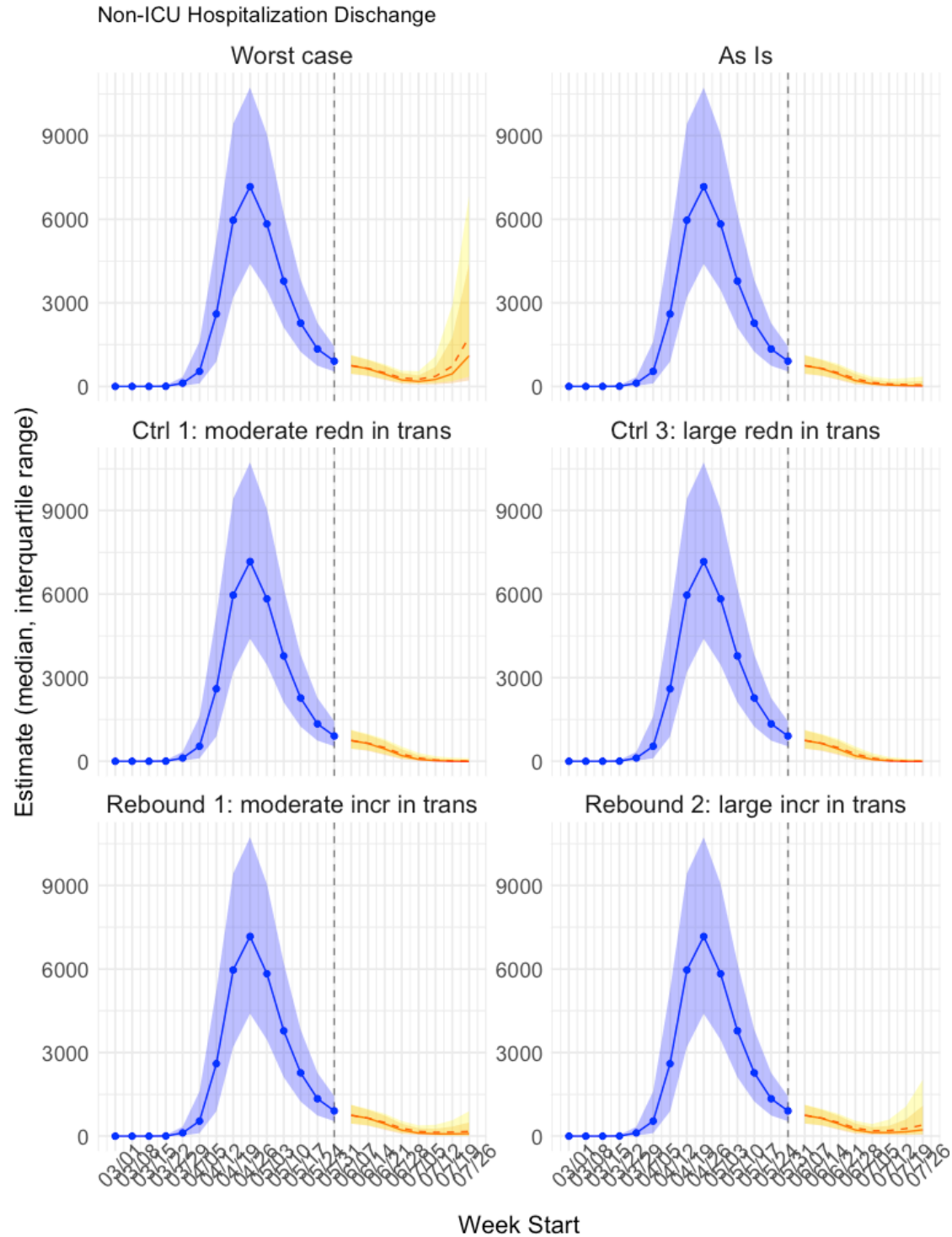
Ventilator Needs (prevalence, mean)

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Total Hospitalization Dischange

Worst case

As Is

Ctrl 1: moderate redn in trans

Ctrl 3: large redn in trans

Rebound 1: moderate incr in trans

Rebound 2: large incr in trans
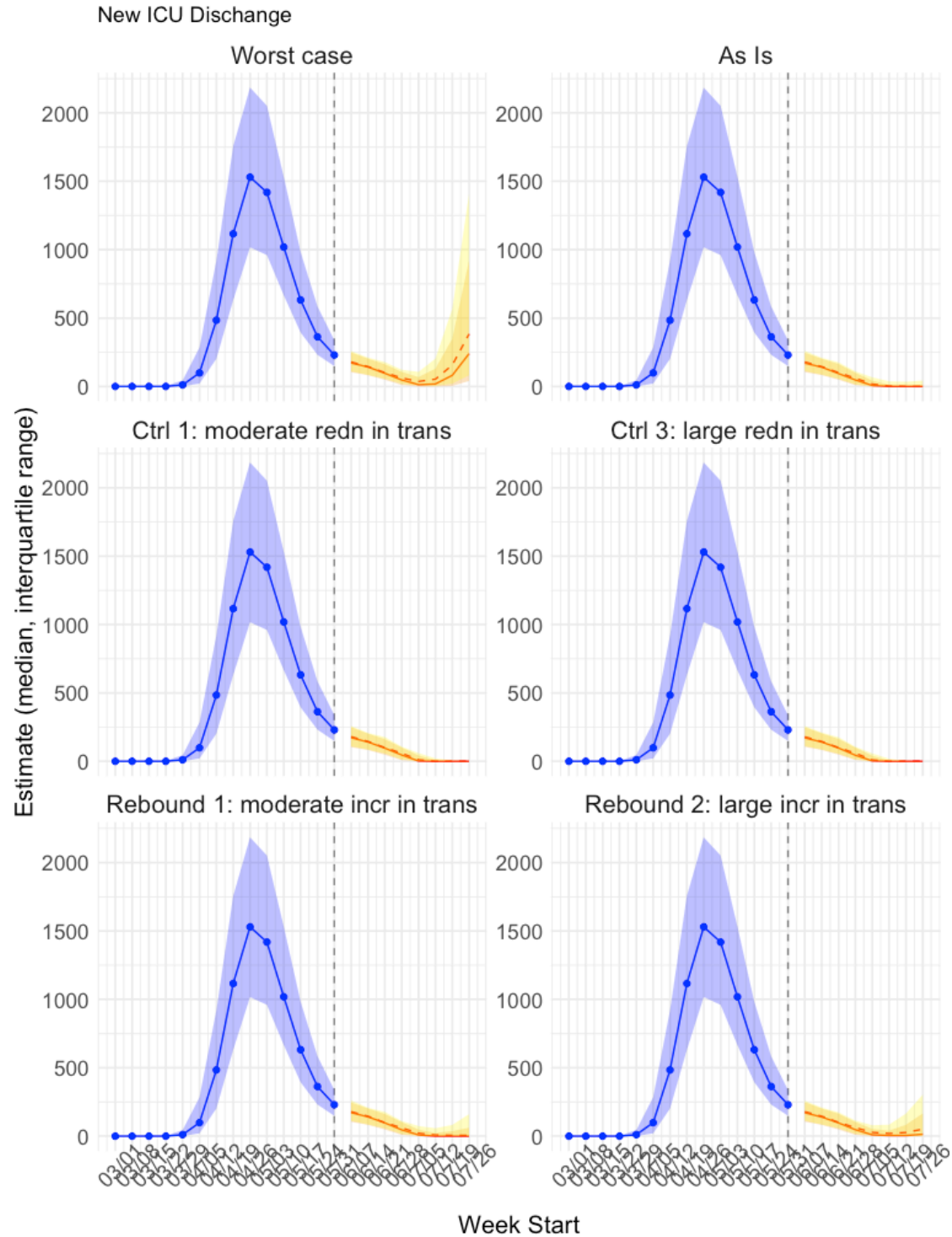
Estimate (median, interquartile range)

Week Start

Projected number for the next 8 weeks under different control scenarios.
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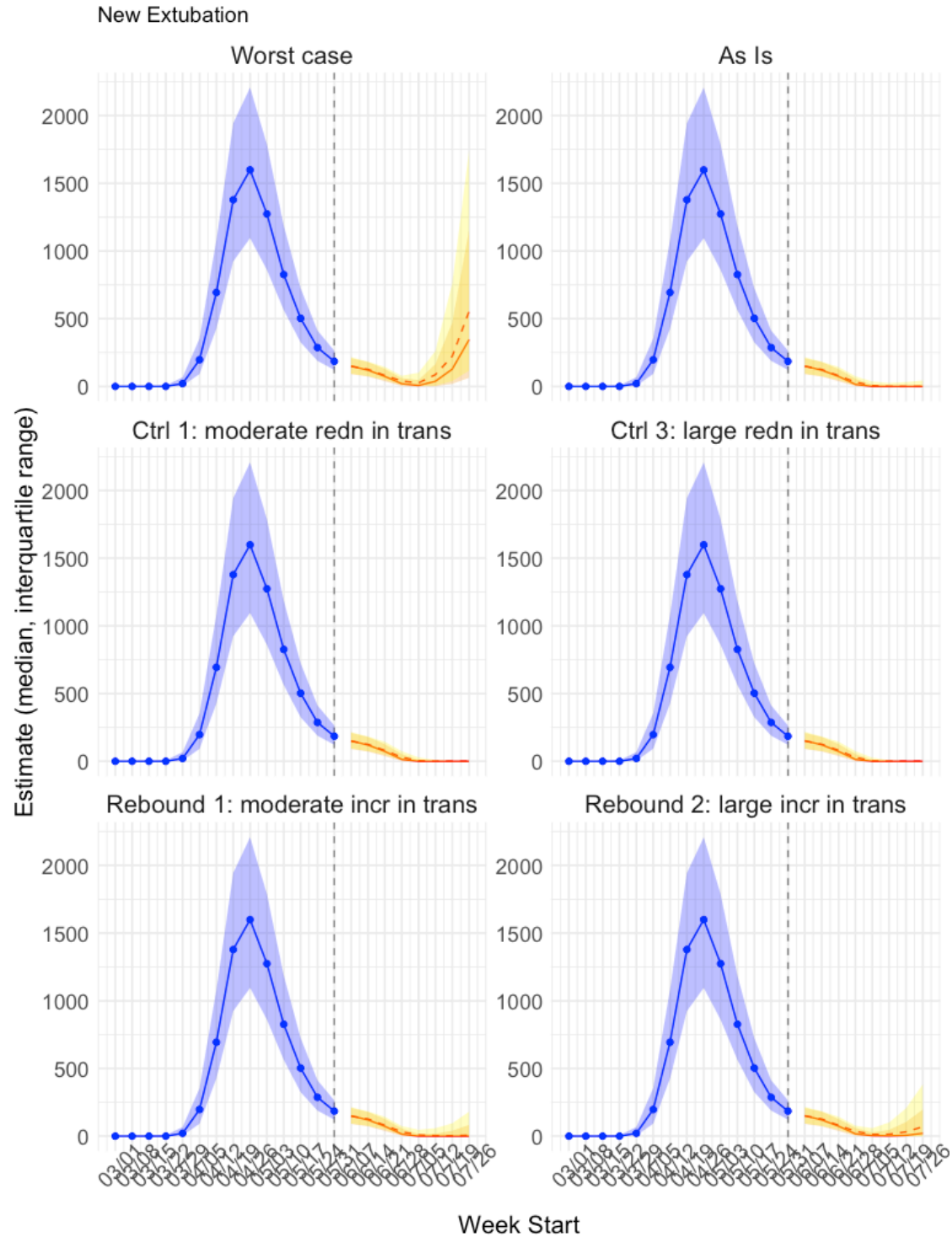## Non-ICU Hospitalization Dischange

Projected number for the next 8 weeks under different control scenarios.
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New ICU Dischange

Projected number for the next 8 weeks under different control scenarios.
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New Extubation

Projected number for the next 8 weeks under different control scenarios.
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