# Reanalysis of ACTT-1 using a Bayesian first-order Markov state transition model for ordinal outcomes

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Background

ACTT-1 was a double-blind, placebo-controlled, randomized trial conducted to assess the efficacy of remdesivir for the treatment of COVID-19.

- 541 subjects assigned to remdesivir.
- 521 subjects assigned to placebo.

Patient status was assessed daily for 28 days using an 8-point ordinal scale (see next slide).

Due to enrollment criteria, only states of 4,5,6, and 7 were represented at baseline.

#### Outcome scale used in ACTT-1

- 1. Not hospitalized and no limitations of activities
- 2. Not hospitalized, with limitation of activities, home oxygen requirement, or both
- 3. Hospitalized, not requiring supplemental oxygen and no longer requiring ongoing medical care (used if hospitalization was extended for infection-control or other nonmedical reasons)
- 4. Hospitalized, not requiring supplemental oxygen but requiring ongoing medical care related to Covid-19 or to other medical conditions
- 5. Hospitalized, requiring any supplemental oxygen
- 6. Hospitalized, requiring noninvasive ventilation or use of high-flow oxygen devices
- 7. Hospitalized, receiving invasive mechanical ventilation or extracorporeal membrane oxygenation (ECMO)
- 8. Death

#### RESULTS

A total of 1062 patients underwent randomization (with 541 assigned to remdesivir and 521 to placebo). Those who received remdesivir had a median recovery time of 10 days (95% confidence interval [CI], 9 to 11), as compared with 15 days (95% CI, 13 to 18) among those who received placebo (rate ratio for recovery, 1.29; 95%) CI, 1.12 to 1.49; P<0.001, by a log-rank test). In an analysis that used a proportional-odds model with an eight-category ordinal scale, the patients who received remdesivir were found to be more likely than those who received placebo to have clinical improvement at day 15 (odds ratio, 1.5; 95% CI, 1.2 to 1.9, after adjustment for actual disease severity). The Kaplan–Meier estimates of mortality were 6.7% with remdesivir and 11.9% with placebo by day 15 and 11.4% with remdesivir and 15.2% with placebo by day 29 (hazard ratio, 0.73; 95% CI, 0.52 to 1.03). Serious adverse events were reported in 131 of the 532 patients who received remdesivir (24.6%) and in 163 of the 516 patients who received placebo (31.6%).

Figure 1: Main results from the original analysis in the New England Journal of Medicine.

The data were fit with a Bayesian proportional odds model where the ordinal outcome *y* was predicted by:

- yprev : the patient's state from the previous day
- tx : the assigned treatment
- day : the current study day (using a restricted cubic spline)
- age : the age of the patient (using a restricted cubic spline)
- tx \* day : treatment / age interaction

The model was fit allowing non-PO only for time, with the constraint is that the departure from PO is linear in **y**. Even though the main time effect is nonlinear, using a restricted cubic spline, the non-PO effect is for linear time.

4,000 posterior draws were obtained using MCMC sampling with **Stan**.

We model the transition probabilities, conditional on the covariates.

However, we can obtain the unconditional probability of being in state Y = y on day  $t \in \{1, 2, ..., 28\}$ .

#### 

Figure 2: R code for model fitting using the rmsb package

A convenient model-derived quantity to measure treatment efficacy is **mean number of days at home**. Using the ordinal scale defined previously, this is mean time spent in states 1 or 2.

Presenting mean number of days at home can be more interpretable to clinicians.

It also has the benefit of being a single number summary that averages over all the days of treatment.

Let  $P_t$  (Y = y) be the probability of being in state y on day t. Then we can define the mean number of days at home as

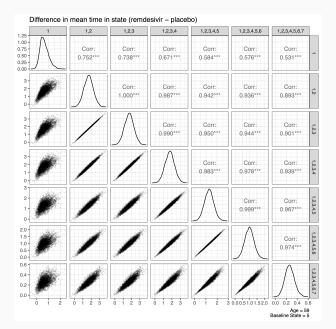
$$\sum_{t} P_t (Y = 1) + \sum_{t} P_t (Y = 2) \quad \text{where } t \in \{1, 2, 3, \dots, 27, 28\}$$

We have the data to compute this quantity in ACTT-1 because the ordinal outcome was assessed daily. In studies where this is not the case, we can use linear interpolation to compute the missing values of  $P_t$  (Y = y).

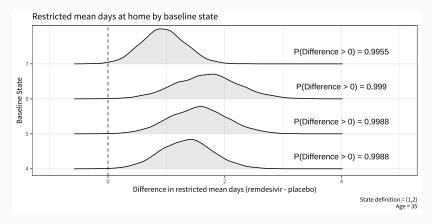
Uncertainty about mean number of days at home can be quantified using the posterior draws obtained when fitting the model.

## Results

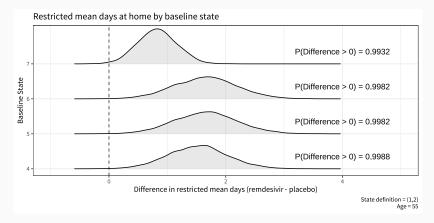
#### Different definitions for mean time in state provide redundant information



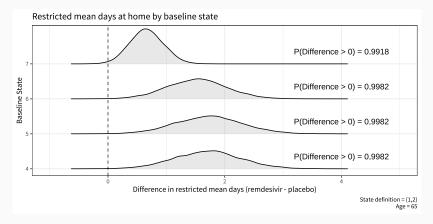
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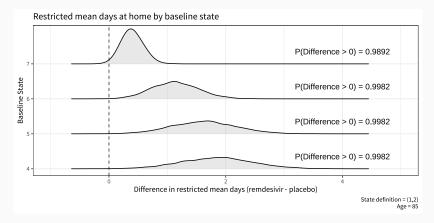
**Figure 3:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on age = 35.



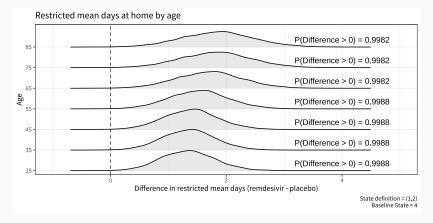
**Figure 4:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on age = 55.



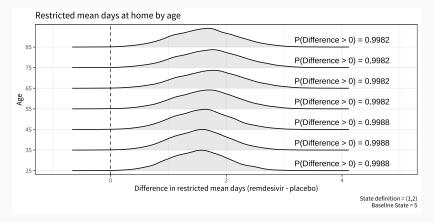
**Figure 5:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on age = 65.



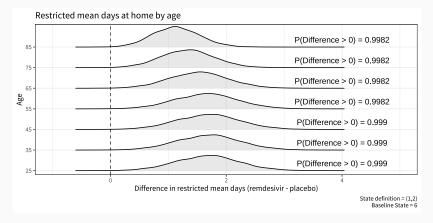
**Figure 6:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on age = 85.



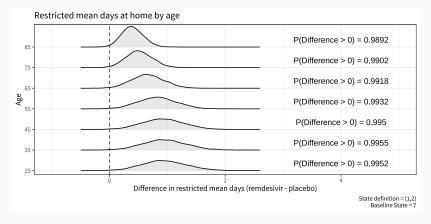
**Figure 7:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on baseline state = 4.



**Figure 8:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on baseline state = 5.



**Figure 9:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on baseline state = 6.



**Figure 10:** Posterior density for difference between mean days at home for Remdesivir and mean days at home for Placebo, conditional on baseline state = 7.

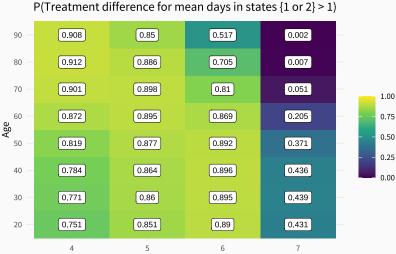
## Probability of benefit (heatmap)





**Figure 11:** Probability that treatment difference is greater than 0 days at home for various covariates.

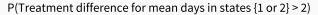
## Probability of benefit (heatmap)

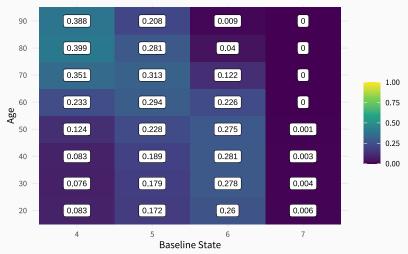


**Baseline State** 

**Figure 12:** Probability that treatment difference is greater than 1 day at home for various covariates.

## Probability of benefit (heatmap)





**Figure 13:** Probability that treatment difference is greater than 2 days at home for various covariates.

### Probability of benefit (heatmap) - perturbed data

#### P(Treatment difference for mean days at home > 0)

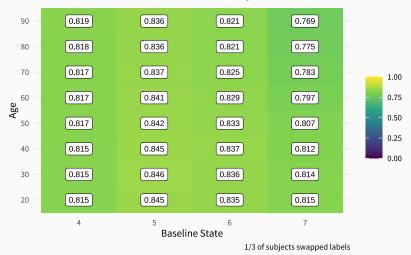
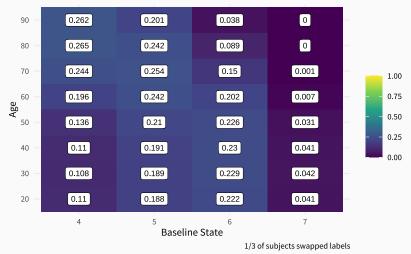


Figure 14: Probability that treatment difference is greater than 0 days at home for various covariates.

### Probability of benefit (heatmap) - perturbed data

#### P(Treatment difference for mean days at home > 1)



**Figure 15:** Probability that treatment difference is greater than 1 day at home for various covariates.

### Probability of benefit (heatmap) - perturbed data

#### P(Treatment difference for mean days at home > 2)

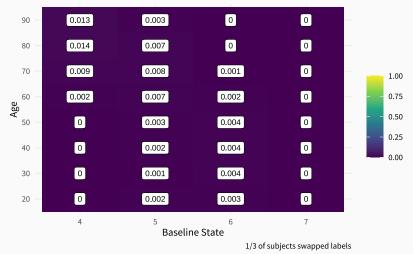


Figure 16: Probability that treatment difference is greater than 2 days at home for various covariates.

#### Treatment effect for days at home given different covariates are correlated

Correlation (Pearson)

Treatment difference for mean days in states 1,2

90.7	0.689	0.755	0.773	0.852	0.709	0.782	0.777	0.876	0.73	0.794	0.778	0.878	0.742	0.802	0.785	0.885	0.765	0.818	0.799	0.888	0.792	0.831	0.796	0.86	0.79	0.852	0.85	0.942	0.814	0.903	0.925	
90.6	0.805	0.867	0.907	0.833	0.853	0.895	0.91	0.854	0.854	0.905	0.911	0.855	0.889	0.907	0.913	0.856	0.895	0.91	0.917	0.851	0.916	0.912	0.901	0.813	0.909	0.925	0.954	0.88	0.931	0.959		0.925
90.5	0.847	0.929	0.959	0.908	0.903	0.957	0.952	0.933	0.922	0.965	0.963	0.936	0.932	0.97	0.965	0.936	0.947	0.976	0.97	0.928	0.954	0.98	0.963	0.902	839.0	0.987	0.965	0.928	0.979		0.969	0.903
90_4	0.897	0.953	0.99	0.882	0.952	0.979	0.993	0.909	0.959	0.985	0.994	0.914	0.977	0.988	0.995	0.911	0.985	0.99	0.994	0.901	0.994	0.989	0.918	0.88	0.997	0.988	0.967	0.878		0.979	0.931	0.814
80_7	0.737	0.839	0.845	0.922	0.779	0.85	0.85	0.958	0.792	0.895	0.852	0.959	0.812	0.878	0.859	0.97	0.841	0.898	0.871	0.965	0.854	0.911	0.895	0.98	0.857	0.925	0.917		0.878	0.928	0.88	0.942
80_6	0.681	0.942	0.975	0.887	0.931	0.965	0.978	0.917	0.945	0.971	0.979	0.925	0.956	0.976	0.981	0.922	0.97	0.95	0.982	0.91	0.974	0.962	0.989	0.905	0.98	0.988		0.917	0.967	0.915	0.954	0.85
80_5	0.871	0.951	0.975	0.918	0.923	0.977	0.98	0.948	0.939	0.983	0.961	0.955	0.951	0.989	0.964	0.952	0.967	0.995	0.985	0.942	0.978	0.998	0.910	0.93	0.985		0.908	0.926	0.988	0.987	0.925	0.852
80_4	0.904	0.957	0.992	0.881	0.959	0.962	0.996	0.909	0.975	0.989	0.996	0.914	0.963	0.991	0.997	0.911	0.991	0.992	0.995	0.9	0.996	0.99	0.99	0.88		0.985	0.98	0.857	0.997	0.966	0.909	0.79
70_7	0.75	0.853	0.857	0.927	0.791	0.872	0.851	0.965	0.801	0.877	0.863	0.978	558.0	0.89	0.87	0.977	0.85	0.908	0.882	0.975	0.85	0.922	0.914		0.88	0.93	0.906	0.98	0.88	0.902	0.813	0.85
70_6	0.892	0.952	0.984	0.888	0.943	0.975	0.987	0.919	0.955	0.98	0.968	0.928	0.966	0.984	0.99	0.923	0.978	0.968	0.991	0.913	0.98	0.989		0.914	0.99	0.988	0.909	0.895	0.988	0.963	0.901	0.796
70_5	0.878	0.956	0.981	0.916	0.932	0.982	0.985	0.946	0.948	0.989	0.986	0.952	0.959	0.993	0.988	0.949	0.973	0.998	0.99	0.939	0.984		0.989	0.922	0.99	0.998	0.962	0.911	0.989	0.98	0.912	0.831
70_4	0.907	0.954	0.992	0.873	0.954	0.981	0.995	0.899	0.981	0.988	0.995	0.903	0.967	0.989	0.995	0.9	0.993	0.968	0.993	0.889		0.984	0.98	0.86	0.998	0.978	0.974	0.854	0.994	0.964	0.916	0.792
60_7	0.752	0.861	0.879	0.951	0.808	0.891	0.883	0.977	0.832	0.903	0.884	0.979	0.843	0.91	0.891	0.986	0.858	0.923	0.91		0.889	0.939	0.913	0.975	0.9	0.942	0.91	0.955	0.901	0.928	0.851	0.888
60_6	0.895	0.953	0.993	0.887	0.953	0.981	0.996	0.912	0.972	0.99	0.996	0.915	0.977	0.99	0.997	0.914	0.982	0.99		0.91	0.993	0.99	0.991	0.882	0.996	0.995	0.962	0.871	0.994	0.97	0.917	0.799
60_5	0.89	0.962	0.995	0.905	0.942	0.905	0.99	0.996	0.956	0.992	0.99	0.943	0.968	0.996	0.991	0.938	0.983		0.99	0.923	0.988	0.998	0.988	0.908	0.992	0.995	0.98	0.898	0.99	0.976	0.91	0.818
60_4	0.92	0.956	0.988	0.849	0.969	0.978	0.991	0.88	0.98	0.98	0.991	0.889	0.99	0.983	0.99	0.881		0.963	0.982	0.858	0.993	0.973	0.978	0.85	0.991	0.967	0.97	0.841	0.905	0.947	0.898	0.765
50_7	0.795	0.893	0.89	0.931	0.829	0.908	0.895	0.976	0.83	0.906	0.897	0.996	0.846	0.916	0.905		0.881	0.938	0.914	0.905	0.9	0.949	0.923	0.977	0.911	0.952	0.922	0.97	0.911	0.936	0.856	0.885
50_6	0.91	0.962	0.995	0.871	0.962	0.985	0.999	0.901	0.975	0.99	1	0.909	0.981	0.991		0.905	0.99	0.991	0.997	0.891	0.996	0.988	0.99	0.87	0.997	0.984	0.981	0.859	0.995	0.966	0.913	0.785
50_5	0.883	0.954	0.988	0.902	0.947	0.985	0.992	0.923	0.971	0.998	0.992	0.922	0.981		0.991	0.916	0.983	0.996	0.99	0.91	0.989	0.993	0.984	0.89	0.991	0.989	0.976	0.878	0.988	0.97	0.907	0.802
50_4	0.895	0.931	0.982	0.847	0.965	0.966	0.985	0.861	0.995	0.982	0.984	0.853		0.981	0.981	0.846	0.99	0.968	0.977	0.843	0.987	0.969	0.966	0.822	0.983	0.951	0.956	0.812	0.977	0.932	0.889	0.742
40_7	0.779	0.884	0.895	0.948	0.82	0.903	0.9	0.987	0.83	0.907	0.902		0.853	0.922	0.909	0.996	0.889	0.943	0.915	0.979	0.903	0.962	0.928	0.978	0.914	0.965	0.925	0.969	0.914	0.936	0.855	0.978
40_6	0.908	0.959	0.996	0.869	0.962	0.985	0.999	0.897	0.978	0.991		0.902	0.984	0.992	1	0.897	0.991	0.99	0.996	0.884	0.995	0.995	0.988	0.863	0.996	0.981	0.979	0.852	0.994	0.963	0.911	0.778
40_5	0.898	0.962	0.988	0.883	0.959	0.991	0.991	0.905	0.979		0.991	0.907	0.982	0.998	0.99	0.906	0.98	0.992	0.99	0.903	0.988	0.909	0.98	0.877	0.989	0.983	0.971	0.956	0.905	0.966	0.905	0.794
40_4	0.914	0.939	0.976	0.814	0.978	0.969	0.978	0.832		0.979	0.978	0.83	0.995	0.971	0.975	0.83	0.98	0.956	0.972	0.832	0.981	0.948	0.955	0.801	0.975	0.939	0.945	0.792	0.969	0.922	0.884	0.73
30_7	0.715	0.84	0.893	0.987	0.789	0.881	0.896		0.832	0.906	0.897	0.987	0.861	0.923	0.901	0.976	0.88	0.936	0.912	0.977	0.899	0.946	0.919	0.965	0.909	0.948	0.917	0.958	0.909	0.933	0.854	0.876
30_6	0.905	0.959	0.998	0.871	0.962	0.984		0.895	0.978	0.991	0.999	0.9	0.985	0.992	0.999	0.895	0.991	0.99	0.996	0.883	0.995	0.985	0.987	0.861	0.996	0.98	0.978	0.85	0.993	0.962	0.91	0.777
30_5	0.944	0.99	0.981	0.837	0.977		0.984	0.881	0.969	0.991	0.985	0.903	0.966	0.985	0.985	0.908	0.978	0.986	0.981	0.891	0.981	0.982	0.975	0.872	0.982	0.977	0.966	0.86	0.979	0.957	0.895	0.782
30_4	0.978	0.975	0.958	0.739		0.977	0.952	0.789	0.978	0.959	0.962	0.82	0.965	0.947	0.962	0.829	0.969	0.942	0.953	0.808	0.964	0.932	0.943	0.791	0.959	0.923	0.931	0.779	0.952	0.903	0.863	0.709
20_7	0.637	0.777	0.87		0.739	0.837	0.871	0.987	0.814	0.883	0.869	0.948	0.847	0.902	0.871	0.931	0.849	0.906	0.887	0.951	0.873	0.916	0.888	0.927	0.881	0.918	0.887	0.922	0.882	0.906	0.833	0.852
20_6	0.902	0.958		0.87	0.958	0.981	0.998	0.893	0.976	0.988	0.996	0.895	0.962	0.988	0.995	0.89	0.988	0.986	0.993	0.879	0.992	0.981	0.984	0.857	0.992	0.976	0.975	0.846	0.99	0.959	0.907	0.773
20_5	0.971				0.975		0.959							0.954																	0.867	
20_4								0.715													0.907			0.75		0.871		0.737			0.805	

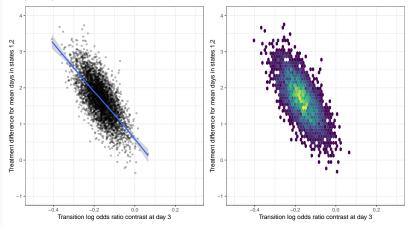
#### Treatment effect for days at home given different covariates agree in sign

Sign Agreement Percentage

Treatment difference for mean days in states 1,2

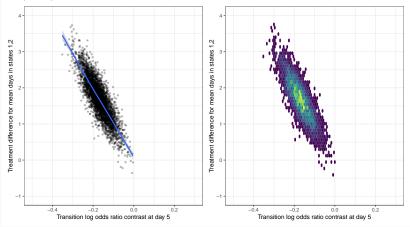
90_7	0.989	0.99	0.989	0.993	0.989	0.99	0.959	0.993	0.989	0.99	0.989	0.993	0.969	0.99	0.99	0.994	0.99	0.99	0.99	0.996	0.99	0.99	0.99	0.997	0.99	0.99	0.99	0.999	0.99	0.99	0.99	
90_6	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.992	1	1		0.99
90_5	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.992	1		1	0.99
90_4	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.992		1	1	0.99
80_7	0.991	0.991	0.991	0.995	0.991	0.991	0.991	0.994	0.991	0.991	0.991	0.994	0.991	0.992	0.991	0.995	0.991	0.992	0.992	0.997	0.992	0.992	0.992	0.999	0.992	0.992	0.992		0.992	0.992	0.992	0.999
80_6	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1		0.992	1	1	1	0.99
80_5	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1		1	0.992	1	1	1	0.99
80_4	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1	1	0.993		1	1	0.992	1	1	1	0.99
70_7	0.992	0.993	0.992	0.996	0.992	0.993	0.992	0.995	0.992	0.993	0.992	0.996	0.992	0.993	0.993	0.997	0.993	0.993	0.993	0.999	0.993	0.993	0.993		0.993	0.993	0.993	0.999	0.993	0.993	0.993	0.997
70_6	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1	1		0.993	1	1	1	0.992	1	1	1	0.99
70_5	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994	1		1	0.993	1	1	1	0.992	1	1	1	0.99
70_4	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1	1	0.994		1	1	0.993	1	1	1	0.992	1	1	1	0.99
60_7	0.994	0.994	0.994	0.997	0.993	0.994	0.994	0.997	0.993	0.994	0.994	0.997	0.993	0.994	0.994	0.998	0.994	0.994	0.994		0.994	0.994	0.994	0.999	0.994	0.994	0.994	0.997	0.994	0.994	0.994	0.996
60_6	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1	1		0.994	1	1	1	0.993	1	1	1	0.992	1	1	1	0.99
60_5	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	1	0.996	1		1	0.994	1	1	1	0.993	1	1	1	0.992	1	1	1	0.99
60_4	1	1	1	0.997	1	1	1	0.997	1	1	1	0.997	1	1	1	0.996		1	1	0.994	1	1	1	0.993	1	1	1	0.991	1	1	1	0.99
50_7	0.995	0.996	0.996	0.999	0.995	0.995	0.996	0.999	0.995	0.995	0.996	0.999	0.995	0.996	0.995		0.995	0.996	0.996	0.998	0.996	0.995	0.996	0.997	0.996	0.996	0.996	0.995	0.995	0.996	0.995	0.994
50_6	1	1	1	0.997	1	1	1	0.997	1	1	1	0.997	1	1		0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.991	1	1	1	0.99
50_5	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999	1	0.999	0.997	0.999		1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.992	1	1	1	0.99
50_4	1	1	1	0.996	1	1	1	0.995	1	1	1	0.996		0.999	1	0.995	1	0.999	0.999	0.993	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.999	0.999	0.989
40_7	0.997	0.997	0.997	1	0.996	0.997	0.997	1	0.996	0.997	0.997		0.996	0.997	0.997	0.999	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.995	0.997	0.997	0.997	0.994	0.997	0.997	0.997	0.993
40_6	1	1	1	0.996	1	1	1	0.997	1	1		0.997	1	0.999	1	0.996	1	0.999	0.999	0.994	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.999	0.999	0.989
40_5	1	1	1	0.997	1	1	1	0.997	1		1	0.997	1	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.991	1	1	1	0.99
40_4	1	1	1	0.996	1	1	1	0.995		1	1	0.996	1	0.999	1	0.995	1	0.999	0.999	0.993	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.999	0.999	0.989
30_7	0.997	0.997	0.997	1	0.996	0.997	0.997		0.996	0.997	0.997	1	0.996	0.997	0.997	0.999	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.995	0.997	0.997	0.997	0.994	0.997	0.997	0.997	0.993
30_6	1	1	1	0.996	1	1		0.997	1	1	1	0.997	1	0.999	1	0.996	1	0.999	0.999	0.994	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.999	0.999	0.989
30_5	1	1	1	0.997	1		1	0.997	1	1	1	0.997	1	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.991	1	1	1	0.99
30_4	1	1	1	0.996		1	1	0.995	1	1	1	0.996	1	0.999	1	0.995	1	0.999	0.999	0.993	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.999	0.999	0.989
20_7	0.995	0.997	0.996		0.996	0.997	0.916	1	0.996	0.997	0.996	1	0.996	0.997	0.997	0.999	0.997	0.997	0.997	0.997	0.997	0.997	0.997	0.995	0.997	0.997	0.997	0.995	0.997	0.997	0.997	0.993
20_6	1	1		0.996	1	1	1	0.997	1	1	1	0.997	1	0.999	1	0.996	1	0.999	0.999	0.994	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.919	0.999	0.989
20_5	1		1	0.997	1	1	1	0.997	1	1	1	0.997	1	1	1	0.996	1	1	1	0.994	1	1	1	0.993	1	1	1	0.991	1	1	1	0.99
20_4		1	1	0.996	1	1	1	0.997	1	1	1	0.997	1	0.999	1	0.996	1	0.999	0.999	0.994	0.999	0.999	0.999	0.992	0.999	0.999	0.999	0.991	0.999	0.919	0.999	0.989
	20 4	20 5	20 6	20 7	30 4	30 5	30 6	30 7	40 4	40 5	40 6	40 7	50 4	50 5	50 6	50 7	60 4	60 5	60 6	60 7	70 4	70 5	70 6	70 7	80 4	80 5	80 6	80 7	90 4	90 5	90 6	90 7

Relationship between transition log odds ratio and treatment difference for mean days in states 1,2 Each point is a posterior draw



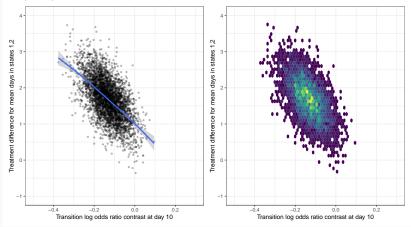
**Figure 17:** Remdesivir - Placebo contrast for transition log odds ratio at day 3 vs treatment difference for mean number of days at home.

Relationship between transition log odds ratio and treatment difference for mean days in states 1,2 Each point is a posterior draw



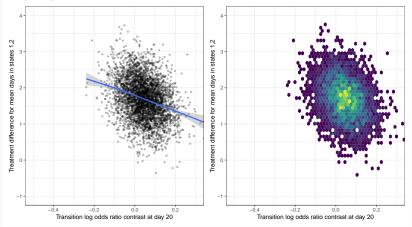
**Figure 18:** Remdesivir - Placebo contrast for transition log odds ratio at day 5 vs treatment difference for mean number of days at home.

Relationship between transition log odds ratio and treatment difference for mean days in states 1,2 Each point is a posterior draw



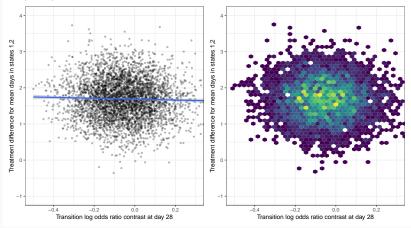
**Figure 19:** Remdesivir - Placebo contrast for transition log odds ratio at day 10 vs treatment difference for mean number of days at home.

Relationship between transition log odds ratio and treatment difference for mean days in states 1,2 Each point is a posterior draw



**Figure 20:** Remdesivir - Placebo contrast for transition log odds ratio at day 20 vs treatment difference for mean number of days at home.

Relationship between transition log odds ratio and treatment difference for mean days in states 1,2 Each point is a posterior draw



**Figure 21:** Remdesivir - Placebo contrast for transition log odds ratio at day 28 vs treatment difference for mean number of days at home.

## Questions?