Stan with PUI

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5/25/2020

Purpose

Compare model fits when incorporating data on persons under investigation (PUI) in hospitals. PUIs are those who are suspected as potential COVID cases who have not yet been confirmed positive.

The STAN model was slightly edited to include PUI by added functionality similar to how the fraction of infected cases which are detected is implemented. An additional prior is incorporated to represent the proportion of PUI who are positive. The model then incorporates this prior times the observed number of PUIs when evaluating model fit (e.g. rather than taking hospitalized and icu as observed, takes hospitalized+frac_pui_pos*hospitalized_puis as observed).

Data

Need two files: one with cases that has columns `Date`, `cum_cases`, and `cum_death` corresponding to the date of observation and the cumulative number of COVID cases and deaths confirmed on that date. The other with columns `date`, `ICU_PUI`, `ICU_CONF`, `HOSP_PUI`, and `HOSP_CONF` corresponding to the date of observation, the number of people under investigation in the ICU, the number of confirmed COVID patients in the ICU, and the same for hospitalized COVID patients (PUI and confirmed patients).

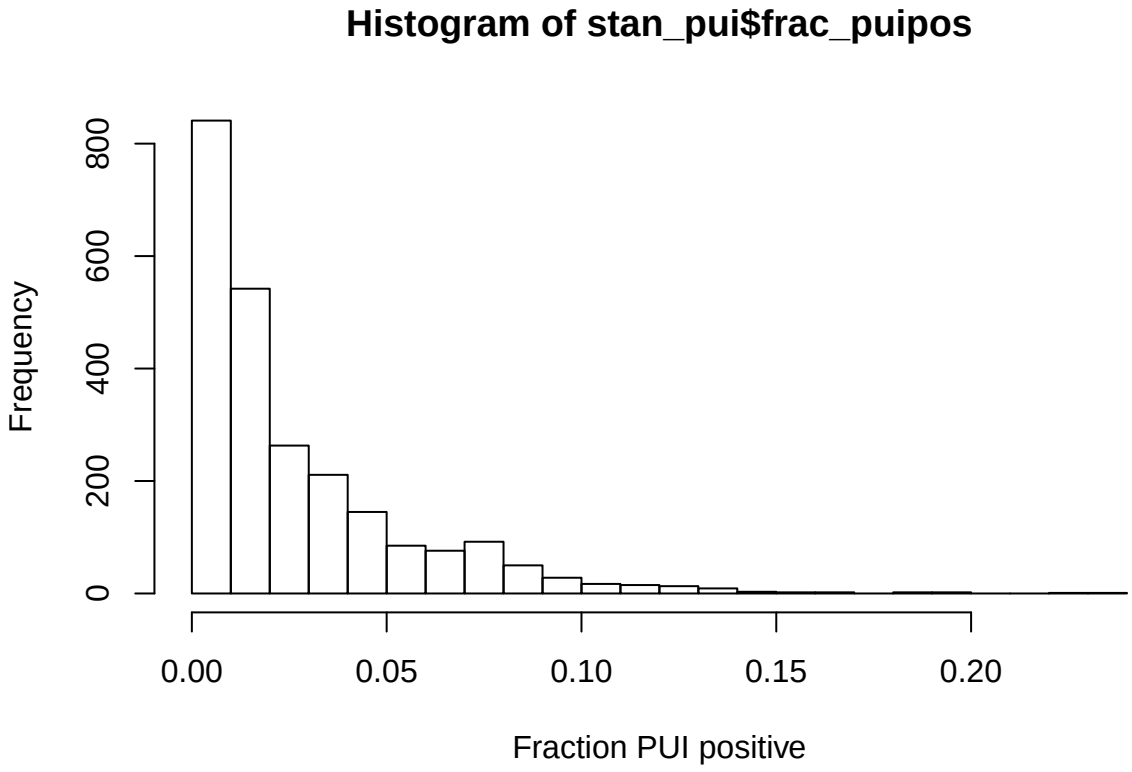
Also takes a pretty hefty parameters list with demographics, priors, and some model settings.

Run model without PUI (done silently)

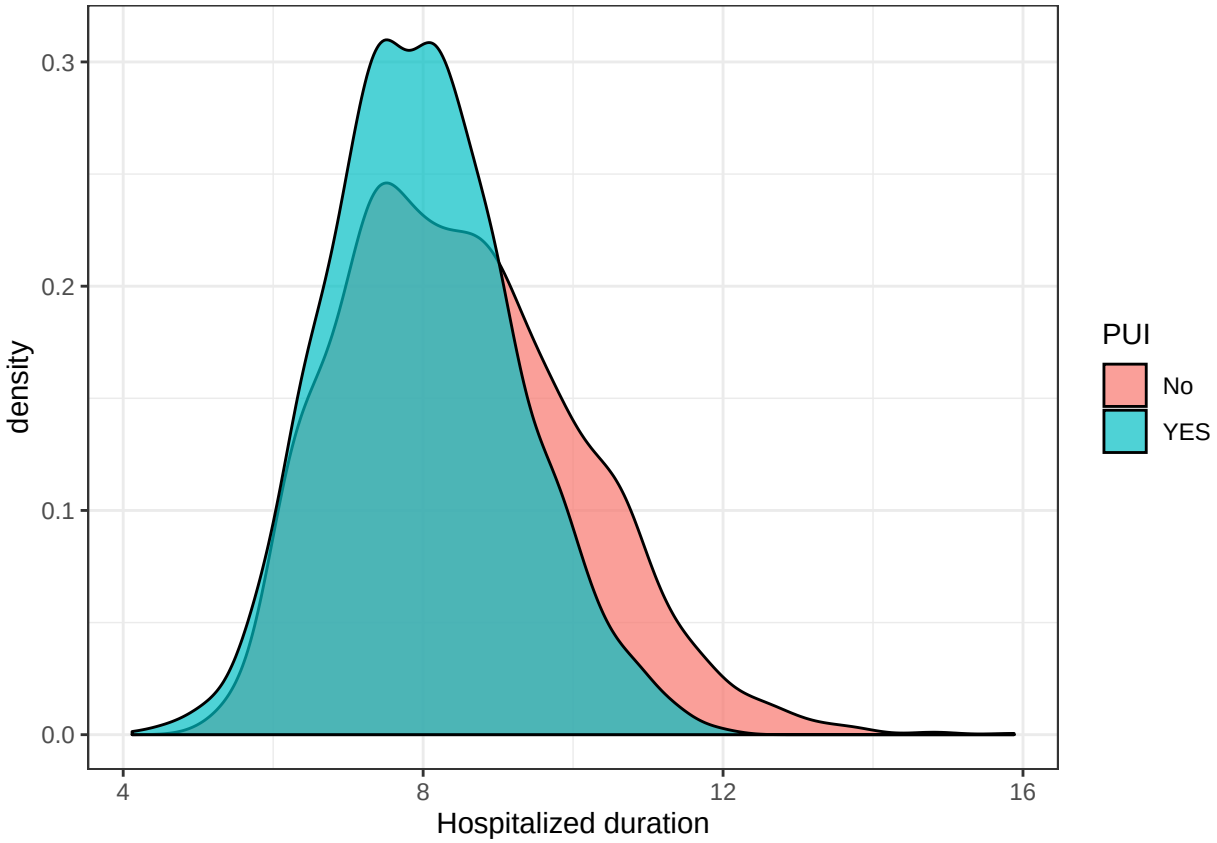
Run model with PUI (done silently)

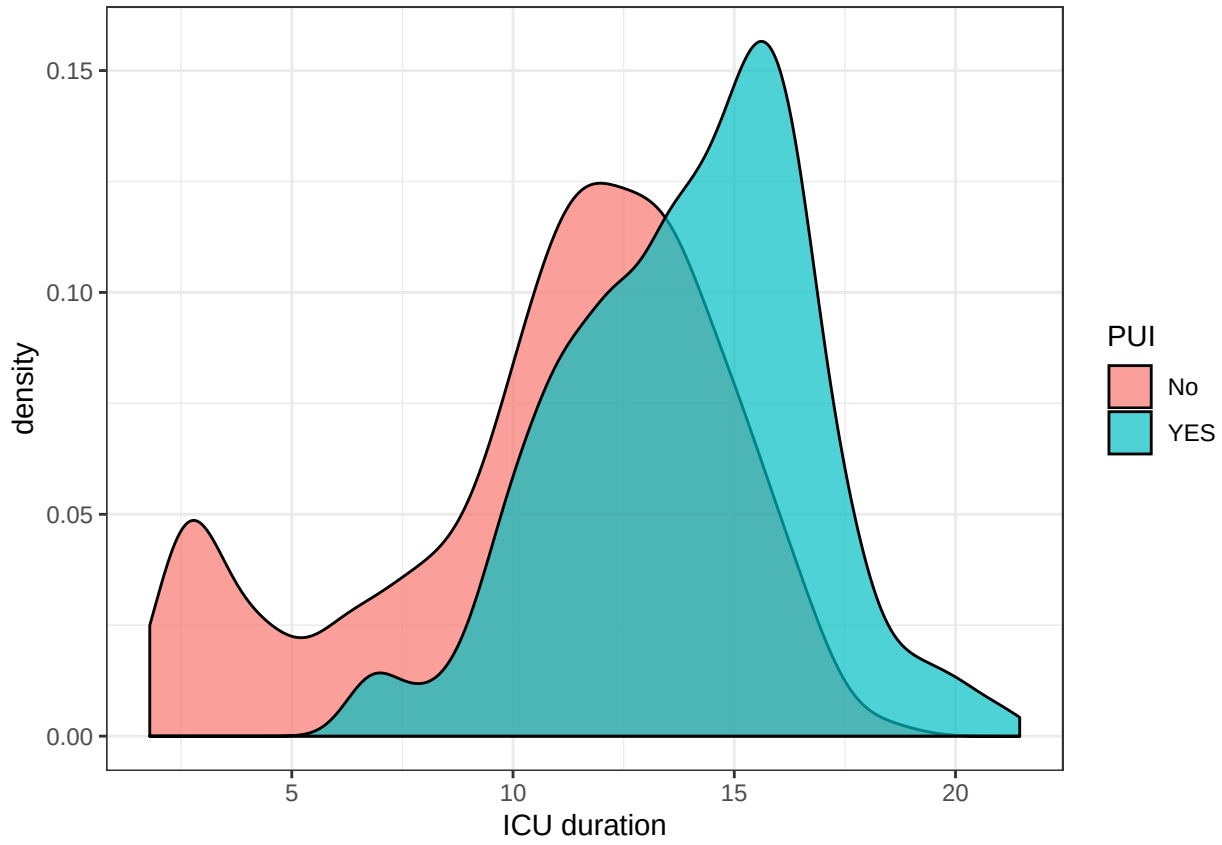
Compare model fits

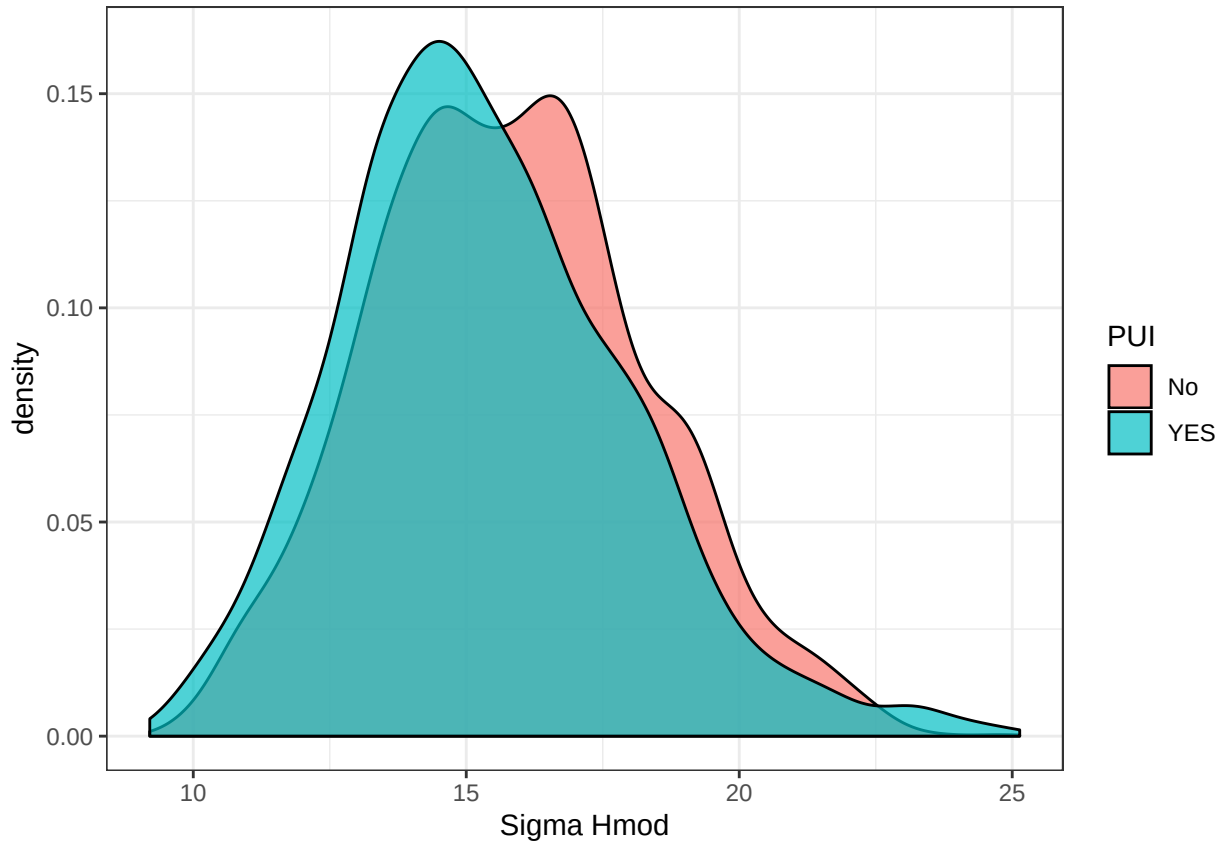
Posterior distribution of pui positive from pui model

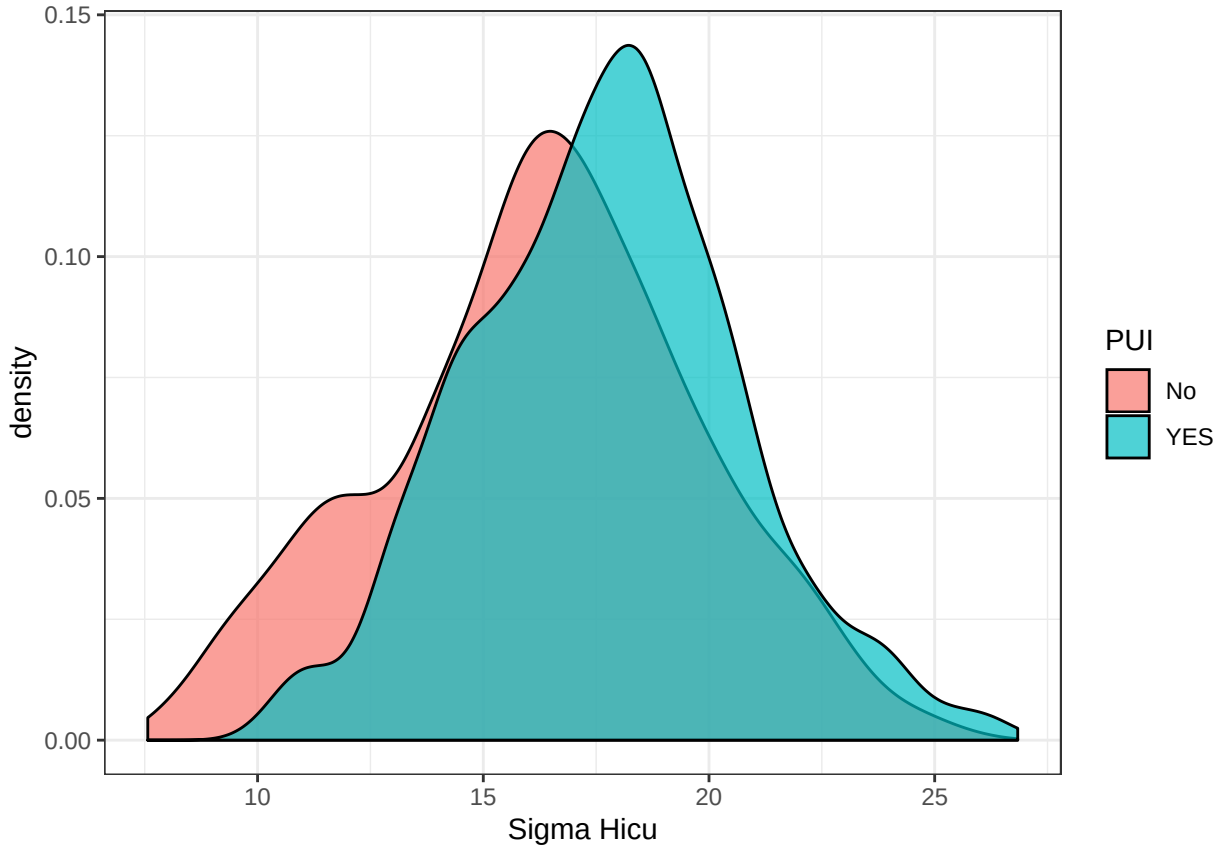


Posterior distribution for hospitalization parameters

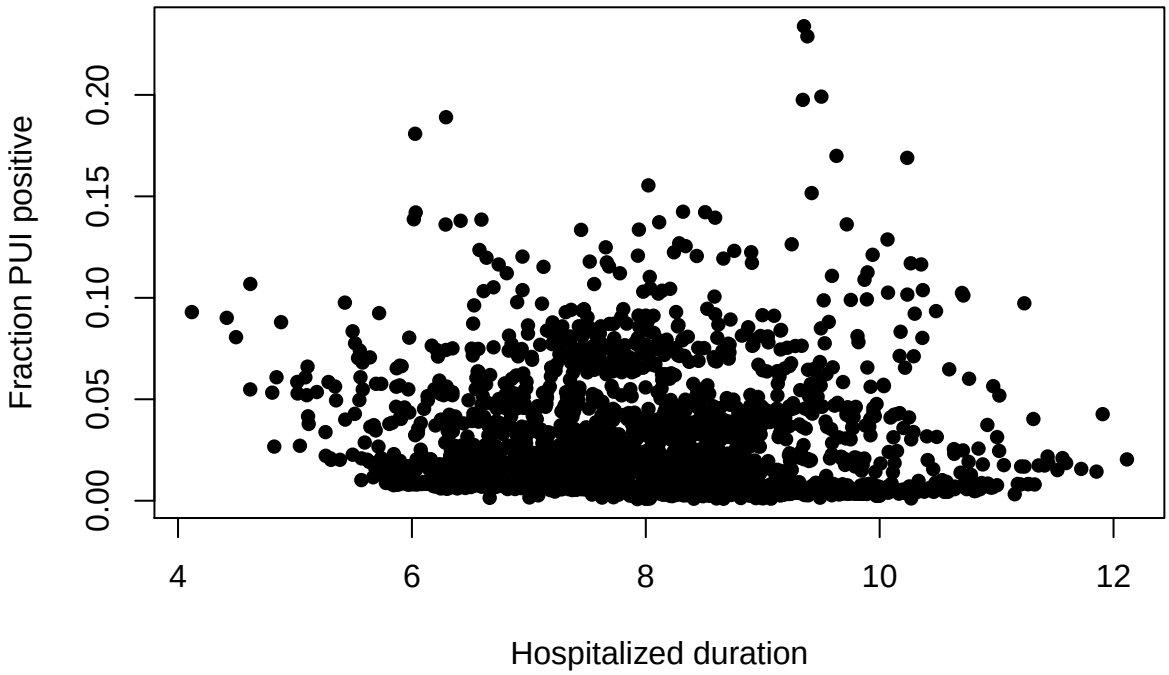


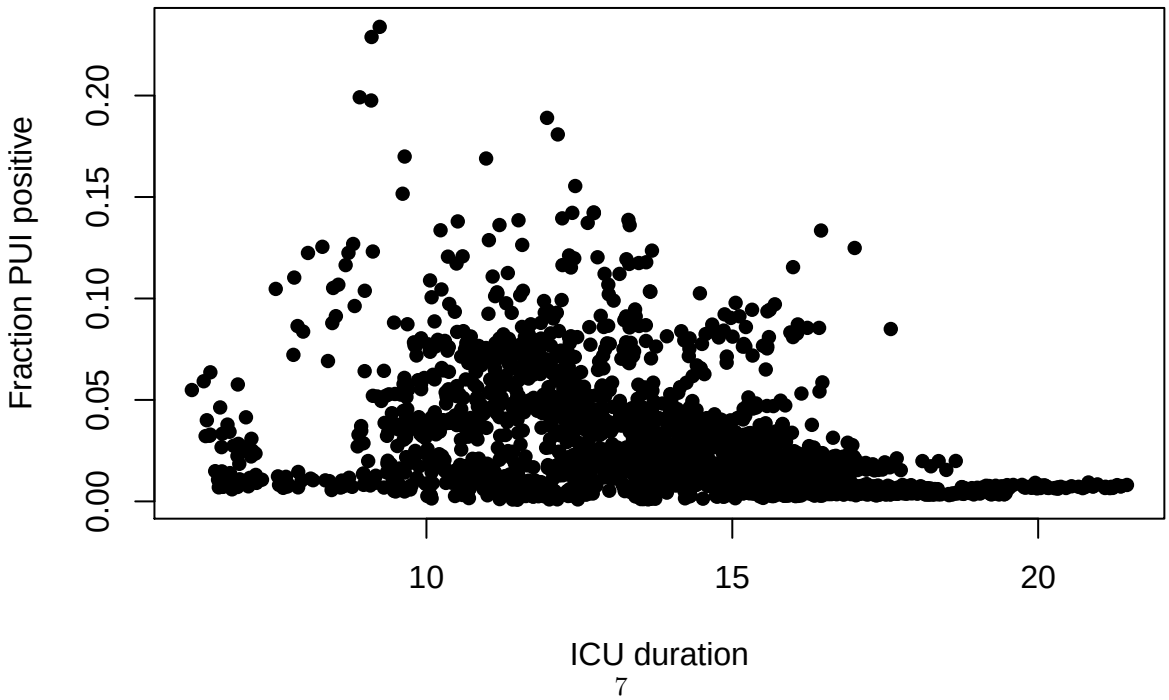

0.15
0.10
0.05
0.00
density
5
10
15
20
ICU duration
PUI
No
YES


0.15
0.10
0.05
0.00
density
10
15
20
25
Sigma Hmod
PUI
No
YES

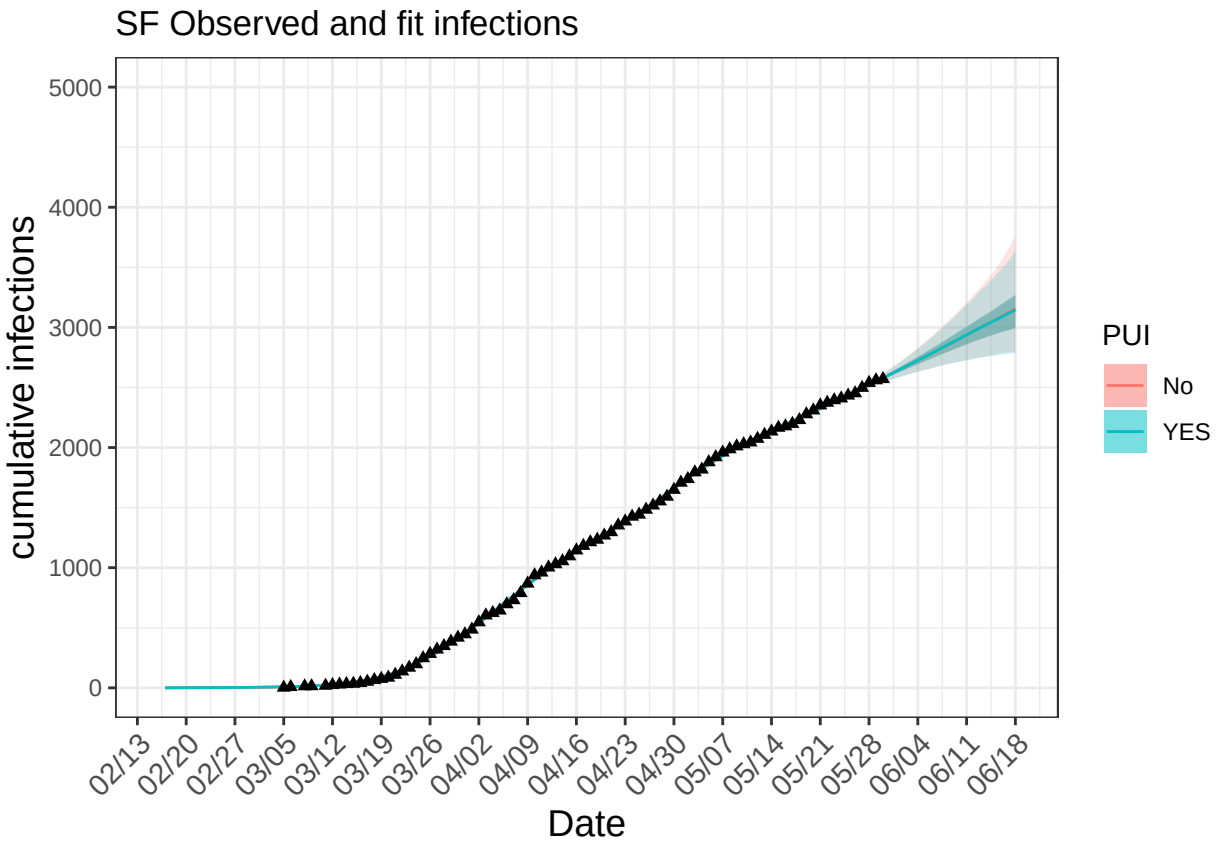

0.15
0.10
0.05
0.00
density
10
15
20
25
Sigma Hicu
PUI
No
YES

Relationship between hospitalization durations and posterior fraction PUI positive



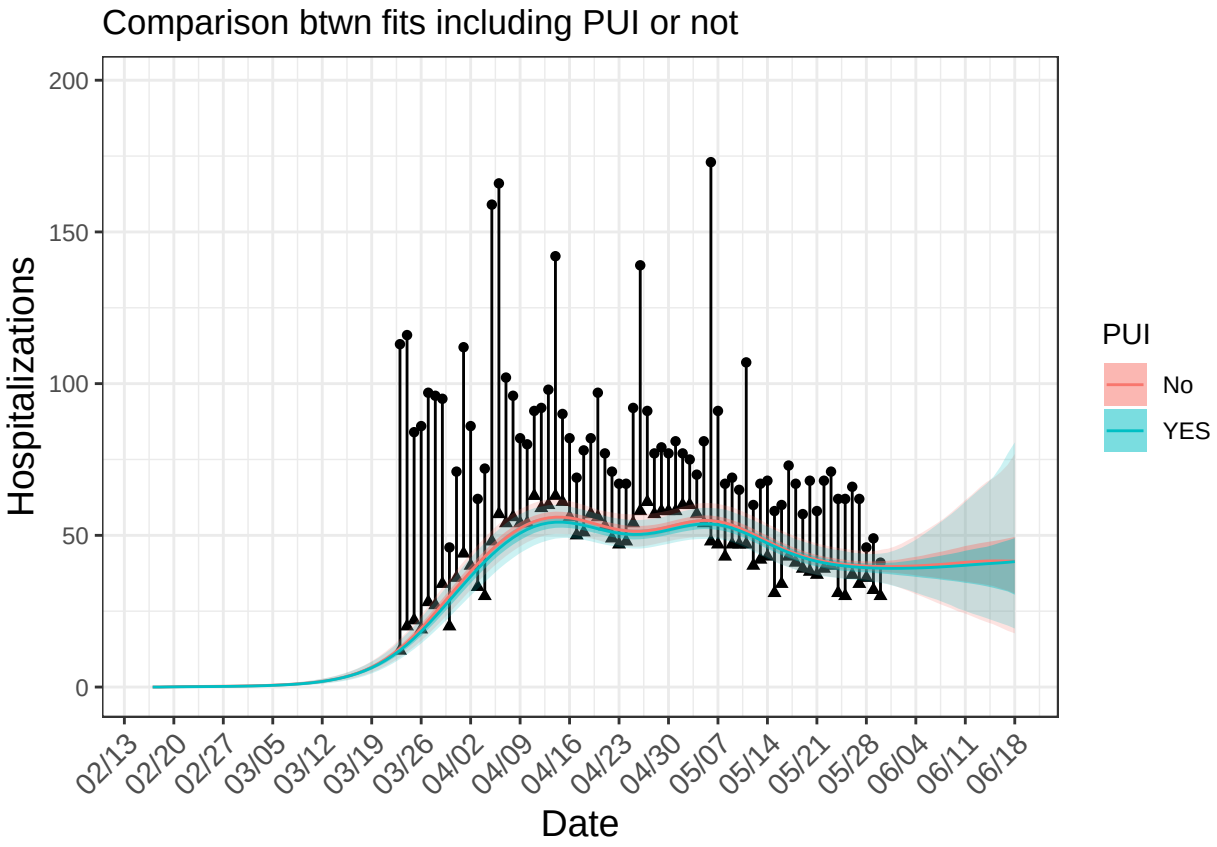


Case numbers



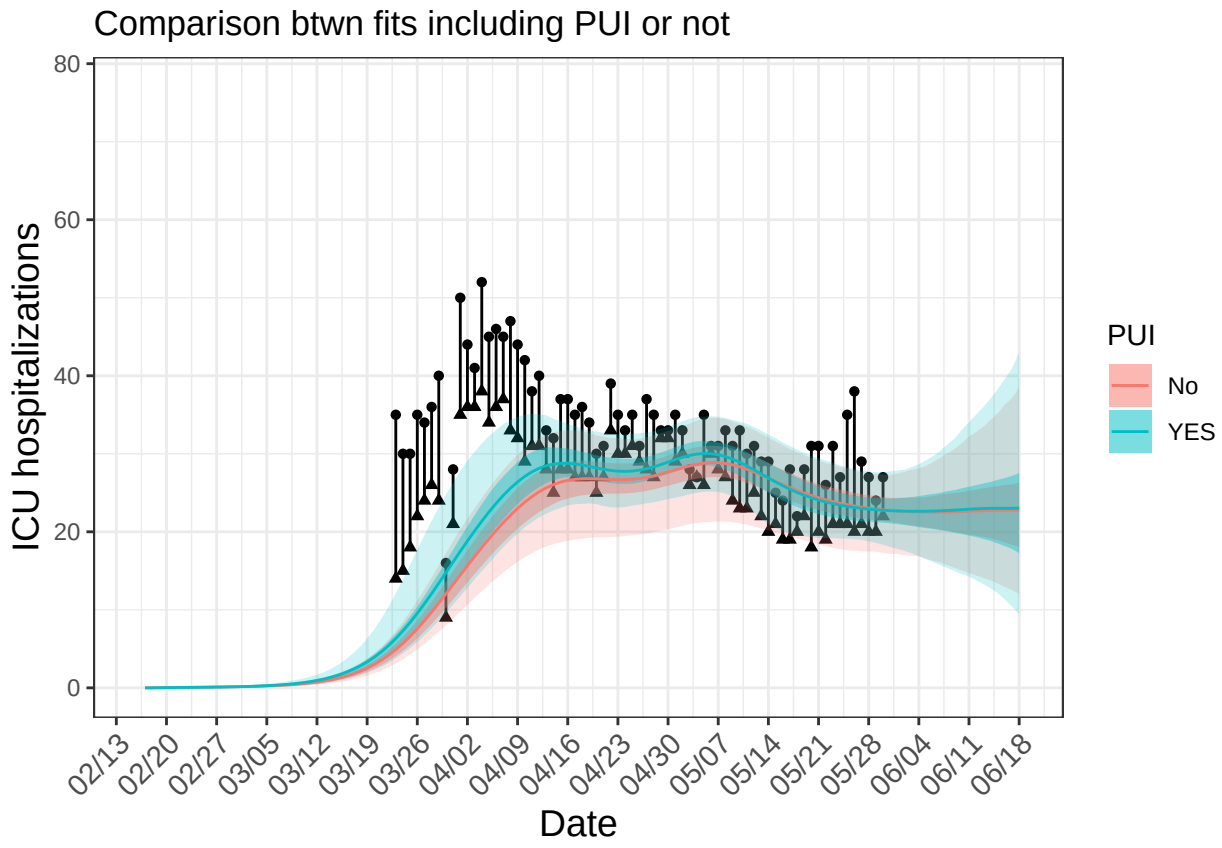
Not much of a difference in the fit, but projections begin to diverge after awhile.

Hospitalizations



Not much of a difference here which I guess makes sense since we're not really changing any of the fitting criteria. Would have to allow PUI to influence how the model fits in order to start really seeing differences, I think, but that would require incorporating some mechanism to generate PUI in the model which seems like more work than it's worth.

ICUs


Comparison btwn fits including PUI or not
ICU hospitalizations
80
60
40
20
0
02/13
02/20
02/27
03/05
03/12
03/19
03/26
04/02
04/09
04/16
04/23
04/30
05/07
05/14
05/21
05/28
06/04
06/11
06/18
Date
PUI
No
YES