Bayesian estimates and weekly predictions of COVID-19 in Uppsala, Sweden

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Introduction

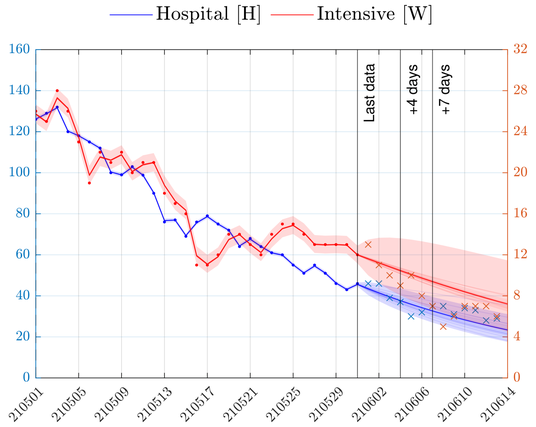
Using publicly available data, we aim to predict the number of hospital and ICU beds needed in the Uppsala region, Sweden. We present a parametric model and Bayesian workflow that allows for multiple levels of data-fusion in Bayesian Inference and provide a 7-day ahead hospital demand prediction.

Data and Method

The data available covers the number of hospitalized (H), in ICU (W), and deaths (D). We infer the posterior parameter distribution of our extended SEIR-model with a Kalman marginal likelihood inside of an adaptive Metropolis sampler. By the nature of the model, we can also produce estimates of all compartments, e.g., the number of individuals that have passed infection and recovered (R).

Results

We provide the Uppsala County Council with 7-day predictions on future care demand with credible intervals (CI). The weekly supplied 68% CI predictions covered the outcome 72% of the time. Further, the parametric models display the past effective reproduction number R_t on a 4-weekly interval.



Long **forward predictions** with limited data are hard for developing pandemics. Nevertheless, **backward reflections** (R_t) are still worthwhile.

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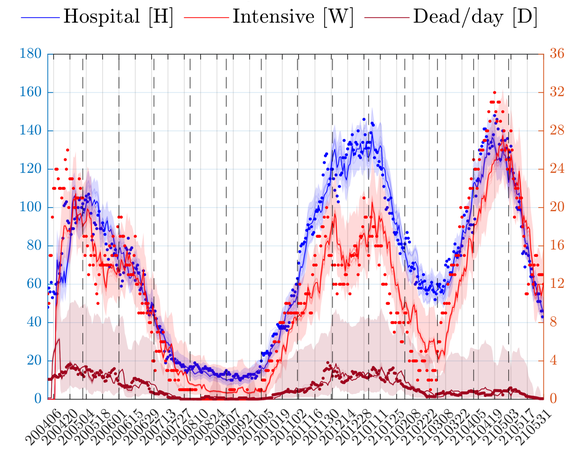
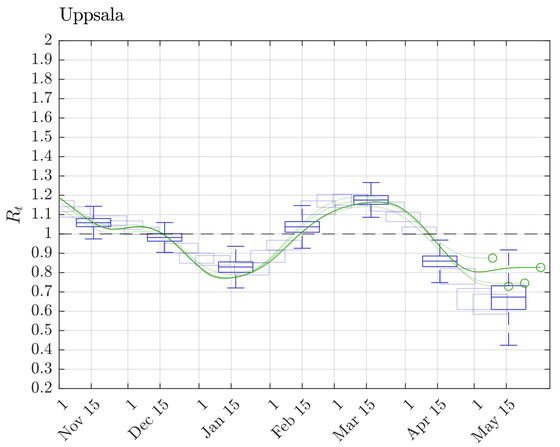
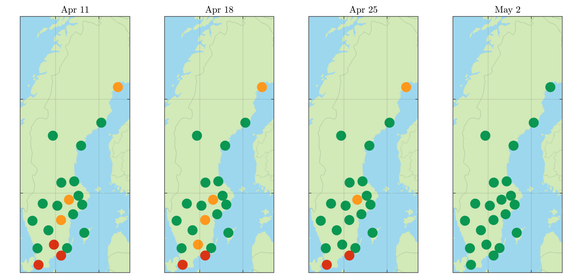
Historic 7-day ahead predictions



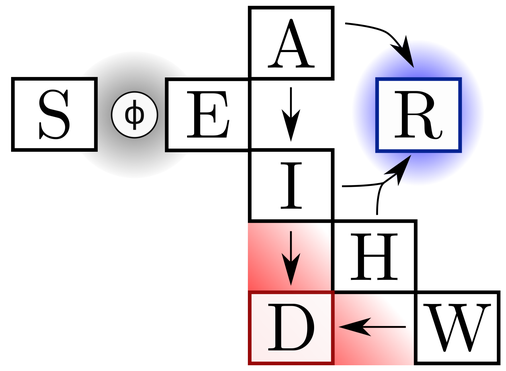
R_t per 4 week period



R_t per Swedish region, ● < 1, ● $= 1$, and ● > 1.



Compartment model.



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